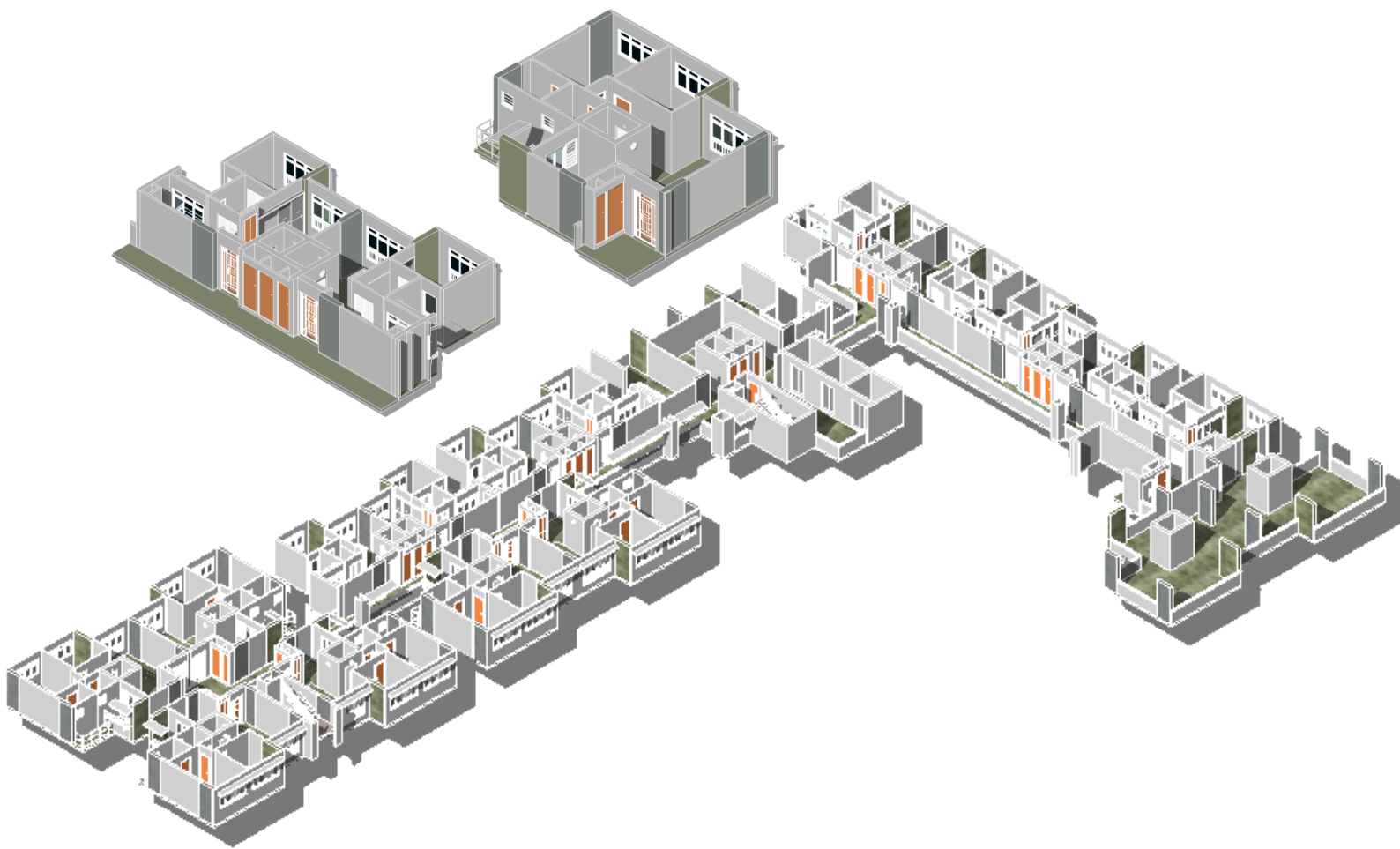


# HDB BIM GUIDE

Version 2.0

July 2015



## FOREWORD

This Guide is prepared by the Housing and Development Board (HDB) and the Building and Construction Authority (BCA) to help consultants and contractors use Building Information Modelling (BIM) in the design and construction of new public housing developments.

HDB and BCA would like to acknowledge the contributions of the following organisations that had provided their valuable inputs in the development of this Guide:

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# OBJECTIVES OF HDB BIM GUIDE

The objective of this Guide is to assist Consultants and Contractors to develop BIM model(s) collaboratively for new public housing developments. It sets out the general requirements for the preparation of a BIM Execution Plan and the guidelines in developing the BIM models for sharing and collaboration amongst the different team members of a HDB project throughout the project life cycle.

This Guide serves as a general reference guide for typical new public housing developments and hence, may not cover all scenarios that may arise. This Guide also does not cover engineering calculations and design analyses. Users are encouraged to adapt the guidelines and steps accordingly to suit their needs.

This Guide is developed using the Autodesk Revit (“Revit”) software. Users are expected to have a basic knowledge of the software. It also does not cover the explanation of Revit terms used. Please refer to support documentation for Revit software for the definitions of Revit terms used.

There are two parts to the Guide:

**Part I: General BIM Requirements & Modelling Guidelines**

This part defines the minimum requirements for BIM implementation and modelling, including the Core Information required in models to be observed for all new public housing developments. There may be additional requirements on a case-by-case basis, depending on the complexity and specific requirements of the development.

**Part II: Modelling Step-by-Step**

This part outlines the steps and procedures for creating the architectural, structural and MEP models for new public housing developments.

It is recommended to read this Guide together with the Singapore BIM Guide and BCA’s BIM e-Submission Guidelines for additional information and other agencies’ requirements.

# PART I

## **GENERAL BIM REQUIREMENTS & MODELLING GUIDELINES**

# 1.0 BIM EXECUTION PLAN

## 1.1 Introduction

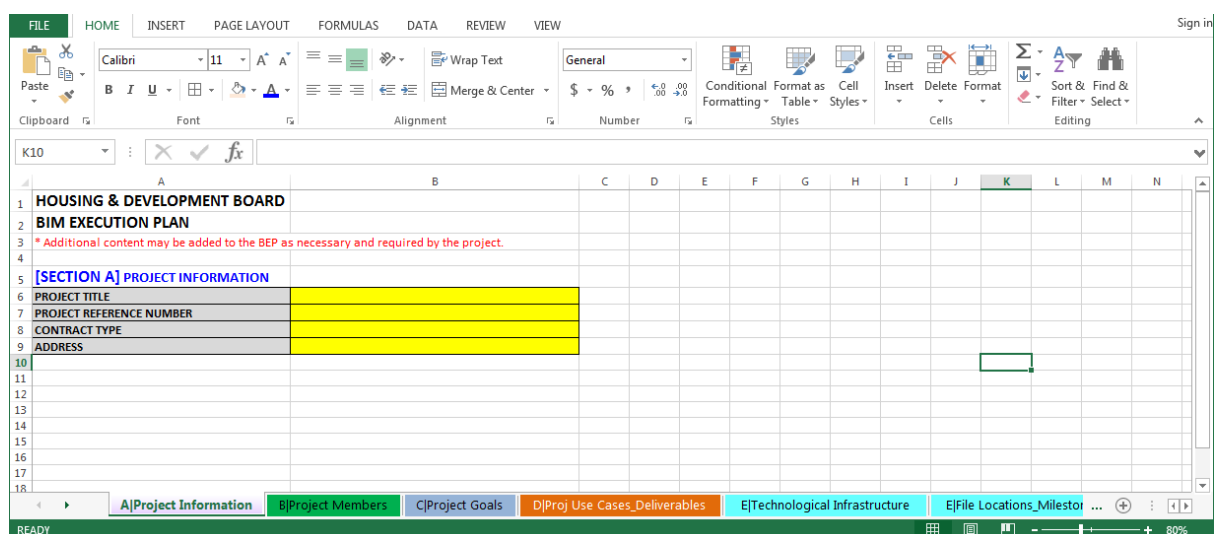
The BIM Execution Plan (BEP) outlines the plan and processes in which BIM will be implemented throughout the project lifecycle. It will form the basis for the Project Team to achieve the BIM goals set for the project.

The BEP shall be updated and implemented by the Project Team in accordance with HDB's BIM Requirements and using the [HDB BEP Template](#) as provided. The BEP shall be submitted to HDB for review and acceptance after the multi-disciplinary consultancy team is appointed according to the timeframe stated in HDB's BIM Requirements.

The BEP shall contain but not limited to, the following contents:

- Project information;
- BIM goals for project;
- BIM use cases for each stage of the project;
- BIM deliverables for each BIM use case;
- Project members' roles, responsibilities and competency;
- BIM process and strategy;
- BIM exchange protocol and submittal format;
- BIM data requirement;
- Collaboration procedures and method to handle shared Models;
- Quality control;
- Technology infrastructure & software; and
- Others

Reference may be made to the 'Singapore BIM Guide Version 2' and the 'BIM Essential Guide for BIM Execution Plan' templates for guidance on the preparation of the BEP.



HDB BEP Template

## 1.2 BIM Objectives, Responsibilities and Deliverables

As part of the BEP, the BIM Manager shall specify the roles and responsibilities of the project members when using BIM at different stages of a project as set out in **Section D** of the BEP 'Project Use Cases and Deliverables'.

1	<b>HOUSING &amp; DEVELOPMENT BOARD</b>		
2	<b>BIM EXECUTION PLAN</b>		
3			
4	<b>[SECTION D] PROJECT USE CASES AND DELIVERABLES</b>		
5	<b>BIM USE CASES</b>	<b>AUTHOR</b>	<b>USERS</b>
6		(AR, CS, ME, EE) <small>IVA</small>	(AR, CS, ME, EE) <small>IVA</small>
35	- (Other purposes)		
36	<b>Detailed Design</b>		
37	Models contain detailed version of generalized building components and systems with accurate dimensions, shape, location, orientation and quantity. Non-geometric properties should be provided.		
38	1. Architectural model(s)		
39	- Regulatory submissions	AR	CS, ME, EE
40	- Tender		
41	2. Structural model(s) & Calculation		
42	- Design, analysis and detailing	CS	AR, ME, EE
43	- In preparation for regulatory submissions		
44	- In preparation for tender		
45	3. M&E model(s) & Analysis		
46	- Design, analysis and detailing	ME, EE	AR, CS
47	- In preparation for regulatory submissions		
48	- In preparation for tender		
49	4. Clash Detection and Resolution / Spatial Validation		
50	- Design coordination between Architectural, Structural and M&E models (before issuing for tender).		
51	- To identify element conflicts and interferences	CS, ME, EE	AR
<span>←</span> <span>▶</span> ... <b>D Proj Use Cases_Deliverables</b> E1 Technological Infrastructure E2 File Locations_Milestones			

HDB BEP Template - Section D: Project Use Cases and Deliverables



## 2.0 BIM STAGES & DELIVERABLES

### 2.1 Stages and Deliverables

The project milestones and the BIM deliverables at each stage will be provided by HDB to the Consultants separately.

## 3.0 CORE INFORMATION & MODELLING

### 3.1 Core Information for BIM Objects

This section defines the list of BIM objects and their core non-geometric attributes that the Consultants shall model for design coordination and possible use by contractors during construction stage.

**Objectives:**

- To standardise the elements used within the software for creating the objects for consistency and clarity in communication between project members;
- To streamline the workflow and reduce the drawings to be produced by the Consultants for use by the Contractor; and
- To define the Core Information for architectural, structural and M&E objects that should be provided by the Consultants for use by the Contractor for construction planning and execution and development of the construction model and improve information flow between the Consultants and Contractor.

Please refer to the **HDB BEP Template** together with the Core Information for list of BIM objects, Revit terms and the core information that require input by the Consultants.

**Note:**

Samples of Revit templates and families will be provided as reference for Consultants to provide the Core Information in their models.

However, HDB shall not be responsible for any costs, expenses, liabilities or damages which may result from the use of these templates and families.

You may refer to **Part II: Section 5.2** of this Guide for the steps to transfer the core information parameters from the Core Information sample templates to your own company's customised templates.

## 4.0 BIM COORDINATION

### 4.1 Quality Assurance

To ensure that the discipline specific model is accurate and correct according to the modelling guidelines set out in the HDB BIM requirements, this Guide and the BEP should be strictly adhered to.

Quality checks should be carried out at two levels:

- a. Each project member should be responsible for performing quality control checks of their design, dataset and model properties before submitting their deliverables and sharing their models with the other disciplines.
- b. Inter-disciplinary models should be checked against each other for clashes and these should be resolved or corrected prior to construction to reduce reworks and variations on site.

Please refer to the 'Singapore BIM Guide Version 2' on Quality Assurance and Quality Control and the Modelling Guidelines to ensure appropriate checks on the model information are done and data accuracy is maintained. Clash detection outlined in the matrix under Part I: Section 4.3 above should also be performed as one of the quality checks.

The BIM Coordinators, BIM Manager and the Consultants are required to declare in the Quality Assurance Checklist provided that the BIM models created comply with the modelling standards set out in the HDB BIM Requirements, this Guide and the BEP.

### 4.2 Sharing of Models

- a. Consultants should create their respective discipline models according to the agreed deliverables and the elements required for each deliverable as stated under **Sections D and F** of the **HDB BEP Template**.

In addition, for the purpose of coordination, Consultants should also incorporate the modelling guidelines as stipulated in **Section G** of the **HDB BEP Template**.

- b. Project members should share their models with one another at frequencies agreed between the members and stated in the BEP for reference when they are developing the model for their own discipline.

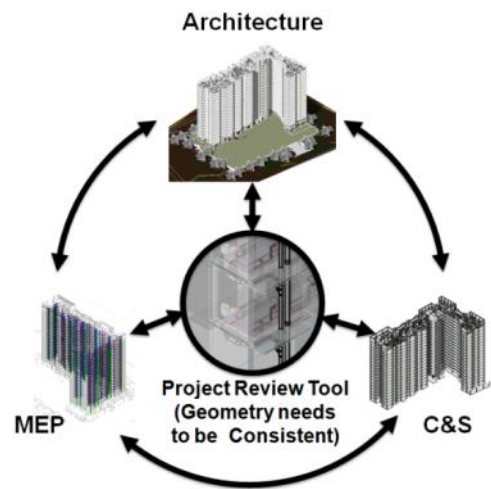
At certain milestones, models from different disciplines should be subjected to various coordination processes to allow the project team to resolve potential conflicts upfront and avoid costly abortive works and delays at the construction stage.

- c. The project team should agree on the frequency of sharing the BIM models and record the agreement in Section E of the BEP. The BIM models should at least be shared according to the milestones provided by HDB separately.
- d. All project members should use a common project base file and use this to model their respective portion.
- e. Proper management of project team and workflow is required for successful BIM coordination.

**Note:**

**Coordination is not done automatically by the computer.**

- f. The BIM model to be shared should be checked, approved and validated by the BIM coordinators for the respective disciplines to be “fit for coordination” prior to sharing. It is recommended to use a common (software) platform to reduce possibilities of data loss or errors when sharing different models.
- g. After the first set of models is received, they should be checked with the Project Review tool to ensure that they are placed in a common location and orientation.



## 4.3 Coordination Process

a. The following items should be discussed and decided at the **BIM Kick-Off Meeting** prior to the commencement of any modelling. The decisions made should be recorded in **Section E** of the **BEP**.

- Schedule;
- File naming convention;
- Location, orientation and reference points;
- File transfer methods;
- File formats; and
- BIM tools and versions

b. It is recommended to export part models as individual files to facilitate inter-disciplinary coordination.

*Example:*

- Each MEP trade as an individual file.
- Each storey as an individual file.
- A storey can be further divided into zones and exported as an individual file for big projects.

Issues could be identified quickly as false issues are minimized. E.g. If a clash checking is done between the electrical system and the ceiling, there will be many false issues between ceiling and flush lights. These clashes can be ignored by not performing the clash between the lights and the ceiling.

c. Decide on the colour codes for each trade and assign them accordingly when they are combined together in a **Project Review Tool**. Colour coding allows users to identify issues visually.

**Note:**

**Avoid colours that were used for highlighting or error by the Project Review Tool.**

*Example:*

Architectural = Dark Green

Structural = Dark Brown

Fire Protection = Dark Red

Plumbing = Light Green

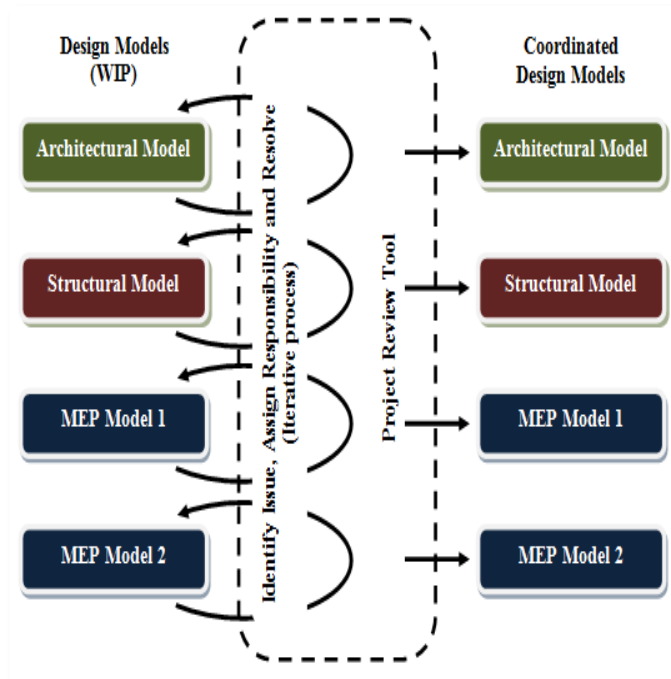
Sewerage = Yellow

d. Perform the coordination check before every coordination meeting; identify clashes, quality issues and geometry inconsistency. Record it for discussion in the meeting. This step is necessary for an effective design coordination meeting.

It is important to recognise that not all conflicts detected are problems. Certain conflicts may have been intentional during the modelling process for the sake of simplifying the modelling process. Proper search sets and clash rules should be set up before running the respective coordination processes, to:

- Reduce time and resources spent on detecting false positives.
- Hide elements that are unnecessary in the coordination process, for example, known issues that are to be resolved in later project stages; elements that do not impact the cost when changed on site, etc.
- Group particular elements for a specific type of coordination process, such as forming groups between a ceiling search set and an MEP model only during a clash analysis





Clash results need to be judged in the context of the elements being analysed, and the type of clash detection software being used. For example, one issue that may occur are duplicate instances of the same clash – for example, a pipe hitting beam could represent 20 clashes when in reality it is only one single issue.



- e. Focus on highlighting and resolving coordination issues at coordination meetings, including identifying the project member responsible to follow up.

**Note:**

**It is recommended to record these issues and the discipline assigned to follow up as a report.**

Image	Clash Name	Status	Distance	Description	Date Found	Assigned To	Clash Point
	New Clash Group	New	-0.30	Hard	2012/6/11 04:20.38		x:-28.86, y:-34.11, z:3.20
	Clash5	New	-0.03	Hard	2012/6/11 04:20.38	Archi Team	x:108.36, y:-32.74, z:3.30
	Clash6	New	-0.03	Hard	2012/6/11 04:20.38		x:-26.66, y:-31.93, z:2.51
	Clash7	New	-0.03	Hard	2012/6/11 04:20.38		x:-26.86, y:-31.73, z:2.50

Item 1				Item 2				Comments
Item ID	Layer	Item Name	Item Type	Item ID	Layer	Item Name	Item Type	
Element ID: 720998	B4	Internal_RC_300mm	Solid	Element ID: 503280	<No level>	Radius Elbows / Tees	Solid	
Element ID: 721010	B4	Internal_RC_300mm	Solid	Element ID: 645265	Level 1	300 x 200	Composite Part	#2 - chidam - 2012/6/11 05:45.38 Assigned to: Archi Team _____ Please create opening on the wall for the Diffuser
Element ID: 721018	B4	Internal_BK_200mm	Solid	Element ID: 533312	<No level>	Radius Elbows / Tees	Solid	
Element ID: 721018	B4	Internal_BK_200mm	Solid	Element ID: 518138	<No level>	Radius Elbows / Tees	Solid	

Sample views of clash reports generated from clash detection software

- f. Clash detection reports for the following types of clashes are to be submitted to HDB using the template provided for record:
- Clashes in areas where clash detection is mandatory;
  - Significant clashes in other areas;
  - Clashes which the project team had agreed to ignore due to excessive modelling efforts required.

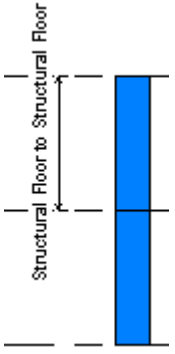
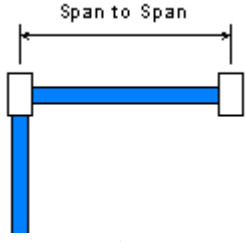
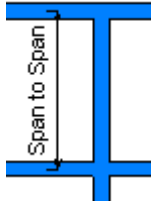
It is mandatory to carry out clash detection at the following areas of a residential unit:

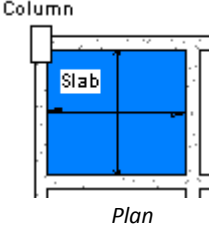
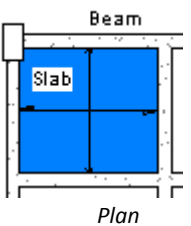
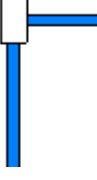
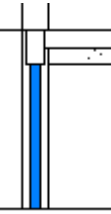
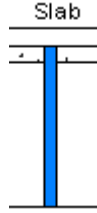
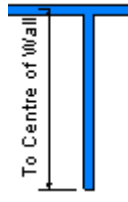
- Wet Areas (between Arch, CS and MEP)
- Service Yards (between Arch and MEP)
- Access to Air-Con Ledges (between Arch and MEP)

## 4.4 Modelling Rules for Clash Detection

This section defines the modelling rules for the 4 primary elements and serves as a checklist for performing clash detection between these key elements. Performing clash detection should form part of the quality assurance for all new public housing developments.

**Note:** This section does not cover clash detection with M&E services. However, clash detection with M&E services should still be performed to ensure quality of the model and to reduce the reworks downstream.

ELEMENT	COLUMN	BEAM	SLAB	WALL
<b>COLUMN</b>	<p><b>COLUMN-COLUMN</b></p>  <p><i>Elevation</i></p> <ul style="list-style-type: none"> <li>• No overlap</li> <li>• Model from Structural Floor to Structural Floor level</li> </ul>			
<b>BEAM</b>	<p><b>BEAM-COLUMN</b></p>  <p><i>Plan</i></p> <ul style="list-style-type: none"> <li>• Model from span to span</li> </ul>	<p><b>BEAM-BEAM</b></p>  <p><i>Plan</i></p> <ul style="list-style-type: none"> <li>• Model from span to span</li> </ul>		

ELEMENT	COLUMN	BEAM	SLAB	WALL
SLAB	<p>SLAB-COLUMN</p>  <p>Plan</p> <ul style="list-style-type: none"> <li>• Model to edge of Column after tender award</li> </ul>	<p>SLAB-BEAM</p>  <p>Plan</p> <ul style="list-style-type: none"> <li>• Model to edge of Beam (if Beams are shown in model) after tender award</li> </ul>		
WALL	<p>WALL-COLUMN</p>  <p>Plan</p> <ul style="list-style-type: none"> <li>• Model to edge of Column</li> </ul>	<p>WALL-BEAM</p>  <p>Section</p> <ul style="list-style-type: none"> <li>• Model to soffit of Beam (if Beams are shown in model) Otherwise, model to soffit of Slab.</li> </ul>	<p>WALL-SLAB</p>  <p>Section</p> <ul style="list-style-type: none"> <li>• Model to soffit of Slab or from SFL to SFL for Structural Wall</li> </ul>	<p>WALL-WALL</p>  <p>Plan</p> <ul style="list-style-type: none"> <li>• Model to centre of Wall</li> </ul>



# PART I: APPENDIX 1

## CORE INFORMATION FOR OBJECTS

## PART I: APPENDIX 1

### I.1.1 Core Information for BIM Objects

**Note:**

1. The Core Information (CI) for the list of BIM objects in this section defines the minimum data required from the Consultants' BIM models during Tender for use by the Contractor for new public housing developments during construction.
2. The attributes must be attached to the BIM elements as parameters.

**Definition of Terms Used:**

<b>Building Element</b>	Refers to the actual physical element constructed on site by the Contractors.
<b>BIM Object</b>	Refers to the Revit object/family to be used to create the building element in the model.
<b>Modelling Requirements</b>	Defines how the BIM object needs to be modelled in order to be useful for the Contractors for downstream BIM uses.
<b>2D View Requirements</b>	Indicates the 2D view that is derived from the BIM model. This is the minimum requirement to be provided so that Consultants need not produce views/drawings that are not necessary for the Contractors.
<b>Parameters</b>	<p>Refer to the <b>attributes/parameters</b> required by the Contractor for their shop drawing production and downstream BIM uses.</p> <p><i>Name:</i> Name of the parameter (specific to Revit software)</p> <p><i>Data List:</i> Valid list of values for each parameter</p> <p><i>Purpose:</i> Reason why this parameter is required. Possible reasons include:</p> <ul style="list-style-type: none"> <li>• Identification</li> <li>• Setting Out</li> <li>• Costing</li> <li>• Coordination</li> <li>• Shop Drawing</li> <li>• CBP (Concrete Body Plan)</li> <li>• Contractor's Use</li> </ul> <p><i>Remark:</i> Any other specific remark in particular to the parameter.</p> <p><b>* All Parameters are "Mandatory" except for those listed under "Optional".</b></p>

## I.1.2 Core Information for Architectural Objects

Building Element	Column				Wall				Floor			
BIM Object	Column: Architectural				Wall: Architectural / Wall: Structural Wall Opening				Floor: Architectural			
Modelling Requirements	<ul style="list-style-type: none"> <li>Model the columns individually for each storey/level.</li> <li>Model the core element from SFL to SFL of above floor.</li> <li>The dimensions of core element to match the structural model.</li> </ul>				<ul style="list-style-type: none"> <li>Model the walls individually for each storey/level.</li> <li>Structural walls model the core from SFL to SFL of above floor. The core thickness to match the structural model.</li> <li>Architectural walls model from SFL to soffit of floor or beam above.</li> </ul>				<ul style="list-style-type: none"> <li>Indicate the FFL.</li> <li>Match the top of core to the SFL of structural model.</li> <li>Model Openings, if any.</li> </ul>			
2D View Requirement	Plans showing the location of each column for setting out				Plans showing the location of each wall for setting out				Plans showing the extent of the floor slab			
Parameters	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks
<b>Default Non-Geometric Parameter (Required for placing the elements in the model)</b>												
	ID		Identification		ID		Identification		ID		Identification	
	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name
<b>Default Geometric Parameter (Required for placing the elements in the model)</b>												
	Base Level		Coordination	Base Reference Level	Base Constraint		Coordination	Base Reference Level	Level		Coordination	
	Base Offset		Coordination		Base Offset		Coordination		Height Offset From Level		Coordination	
	Top Level		Coordination		Top Constraint		Coordination		Dimensions		<ul style="list-style-type: none"> <li>Costing</li> <li>Coordination</li> <li>Shop Drawing</li> </ul>	Thickness
	Top Offset		Coordination		Top Offset		Coordination					
	Dimensions		<ul style="list-style-type: none"> <li>Costing</li> <li>Setting-out</li> <li>Coordination</li> <li>Shop Drawing</li> </ul>	Diameter x Height or Length x Width x Height	Dimensions		<ul style="list-style-type: none"> <li>Costing</li> <li>Setting-out</li> <li>Coordination</li> <li>Shop Drawing</li> </ul>	Thickness x Length x Height				
<b>Manual Entry</b>												
	Finish Thickness		<ul style="list-style-type: none"> <li>Costing</li> <li>Setting-out</li> <li>Coordination</li> <li>Shop Drawing</li> </ul>		Finish Thickness		<ul style="list-style-type: none"> <li>Costing</li> <li>Setting-out</li> <li>Coordination</li> <li>Shop Drawing</li> </ul>		Finish Thickness		<ul style="list-style-type: none"> <li>Costing</li> <li>Setting-out</li> <li>Coordination</li> <li>Shop Drawing</li> </ul>	
	Material		Costing	Core & Finish Material	Material		Costing	Core & Finish Material	Material		Costing	Core and Finish Material
					Construction Method	Follow BScore List	<ul style="list-style-type: none"> <li>Buildable Design Score</li> <li>Contractor's Use</li> </ul>	*NEW (Manual Entry)	Construction Method	Follow BScore List	<ul style="list-style-type: none"> <li>Buildable Design Score</li> <li>Contractor's Use</li> </ul>	*NEW (Manual Entry)
<b>Calculated</b>												
					Length		Costing					
<b>Optional</b>												
	Block Number		Contractor's Use	*NEW (Manual Entry)	Block Number		Contractor's Use	*NEW (Manual Entry)	Block Number		Contractor's Use	*NEW (Manual Entry)
	Unit Type		Contractor's Use	*NEW (Manual Entry)	Unit Type		Contractor's Use	*NEW (Manual Entry)	Unit Type		Contractor's Use	*NEW (Manual Entry)
					Parapet	<ul style="list-style-type: none"> <li>Yes</li> <li>No</li> </ul>	Contractor's Use	*NEW (Manual Entry)				
					Fire Rating		<ul style="list-style-type: none"> <li>Costing</li> <li>Contractor's Use</li> </ul>					

## I.1.2 Core Information for Architectural Objects

Building Element	Door				Window				Railing			
BIM Object	Door				Window				Railing			
Modelling Requirements	<ul style="list-style-type: none"> <li>• Door opening to follow Structural opening.</li> <li>• Location to be based on the Room 'from' which the Door opens.</li> <li>• Door to be coordinated with Structural Openings if in Structural Wall.</li> <li>• Main Entrance Gates to be modelled as part of Main Door.</li> <li>• Ironmongery may be provided as Specification (parameter) and does not need to be modelled.</li> </ul>				<ul style="list-style-type: none"> <li>• Window opening to follow Structural opening.</li> <li>• Location to be based on the Room 'from' which the Window opens.</li> <li>• Window to be coordinated with Structural Openings if in Structural Wall.</li> <li>• Do not over model. Specifications (parameter) may be used for details.</li> </ul>				<ul style="list-style-type: none"> <li>• Model handrail only (not representative). Actual design to refer to HDB's guide detail drawings.</li> </ul>			
2D View Requirement	Plan showing the location of each door with identification				Plan showing the location of each window with identification				Plan showing location of railing with identification			
Parameters	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks
Default Non-Geometric Parameter (Required for placing the elements in the model)												
	ID		Identification		ID		Identification		ID		Identification	
	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name
Default Geometric Parameter (Required for placing the elements in the model)												
	Level		Coordination		Level		Coordination		Base Level		Coordination	
	Sill Height		Coordination		Sill Height		Coordination		Base Offset		Coordination	
	Dimensions		<ul style="list-style-type: none"> <li>• Costing</li> <li>• Coordination</li> <li>• Shop Drawing</li> </ul>	Width x Height (Structural Opening)	Dimensions		<ul style="list-style-type: none"> <li>• Costing</li> <li>• Coordination</li> <li>• Shop Drawing</li> </ul>	Width x Height (Structural Opening)	Tread/ Stringer Offset		Coordination	
									Railing Height		Coordination	
Manual Entry												
	Door Type		<ul style="list-style-type: none"> <li>• Costing</li> <li>• Shop Drawing</li> </ul>	Type Name	Window Type		<ul style="list-style-type: none"> <li>• Costing</li> <li>• Coordination</li> <li>• Shop Drawing</li> </ul>	Type Name	Railing Type		Shop Drawing	Type Name
	Door Description		<ul style="list-style-type: none"> <li>• Costing</li> <li>• Shop Drawing</li> </ul>	Type Name	Window Description		<ul style="list-style-type: none"> <li>• Costing</li> <li>• Shop Drawing</li> </ul>	Type Name	Railing Description		Shop Drawing	Type Name
	Function		Contractor's Use		Window Schedule		<ul style="list-style-type: none"> <li>• Costing</li> <li>• Contractor's Use</li> </ul>	*NEW (Graphical Window Schedule not required)				
	Fire Rating		Costing									
	Door Schedule		<ul style="list-style-type: none"> <li>• Costing</li> <li>• Contractor's Use</li> </ul>	*NEW (Graphical Door Schedule not required)								
Calculated												
									Railing Length		<ul style="list-style-type: none"> <li>• Costing</li> <li>• Contractor's Use</li> </ul>	
Optional												
	Block Number		Contractor's Use	*NEW (Manual Entry)	Block Number		Contractor's Use	*NEW (Manual Entry)	Block Number		Contractor's Use	*NEW (Manual Entry)
	Unit Type		Contractor's Use	*NEW (Manual Entry)	Unit Type		Contractor's Use	*NEW (Manual Entry)	Railing Location		Contractor's Use	*NEW (Manual Entry)
	Door Location		Contractor's Use	*NEW Room Name (Manual Entry)	Window Location		Contractor's Use	*NEW Room Name (Manual Entry)				

## I.1.2 Core Information for Architectural Objects

Building Element	Ramp				Staircase				Roof			
BIM Object	Ramp				Stair				Roof			
Modelling Requirements	<ul style="list-style-type: none"> <li>For HDB MSCP driveway ramps, use 'Ramp' for Architectural Model and use 'Slab' for Structural Model.</li> <li>Structural Model to create ramp based on Architectural Model.</li> </ul>								<ul style="list-style-type: none"> <li>For Flat Roofs, Roof Tops and Walkways, use 'Roof' to model element.</li> </ul>			
2D View Requirement	Plan showing location of ramp with identification				Plan showing location of staircase with identification				Plan showing location of roof with identification			
Parameters	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks
<b>Default Non-Geometric Parameter (Required for placing the elements in the model)</b>												
	ID		Identification		ID		Identification		ID		Identification	
	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name
<b>Default Geometric Parameter (Required for placing the elements in the model)</b>												
	Base Level		Coordination		Base Level		Coordination		Base Level		Coordination	
	Base Offset		Coordination		Base Offset		Coordination		Base Offset From Level		Coordination	
	Top Level		Coordination		Top Level		Coordination		Slope		<ul style="list-style-type: none"> <li>Costing</li> <li>Coordination</li> <li>Shop Drawing</li> </ul>	
	Top Offset		Coordination		Top Offset		Coordination		Thickness		<ul style="list-style-type: none"> <li>Costing</li> <li>Coordination</li> <li>Shop Drawing</li> </ul>	
	Width		<ul style="list-style-type: none"> <li>Costing</li> <li>Coordination</li> <li>Shop Drawing</li> </ul>		Maximum Riser Height		<ul style="list-style-type: none"> <li>Coordination</li> <li>Shop Drawing</li> </ul>					
	Thickness		<ul style="list-style-type: none"> <li>Costing</li> <li>Coordination</li> <li>Shop Drawing</li> </ul>		Minimum Run Width		<ul style="list-style-type: none"> <li>Coordination</li> <li>Shop Drawing</li> </ul>					
	Ramp Max Slope		Coordination		Number of Risers		<ul style="list-style-type: none"> <li>Coordination</li> <li>Shop Drawing</li> </ul>					
<b>Manual Entry</b>												
	Function		Contractor's Use		Construction Method	Refer to Data Dictionary	Contractor's Use	*NEW	Material		<ul style="list-style-type: none"> <li>Costing</li> <li>Coordination</li> <li>Shop Drawing</li> </ul>	
	Ramp Material		<ul style="list-style-type: none"> <li>Costing</li> <li>Contractor's Use</li> </ul>									
	Construction Method	Refer to Data Dictionary	Contractor's Use	*NEW								
<b>Calculated</b>												
									Area		Costing	
									Volume		Costing	
<b>Optional</b>												
					Block Number		Contractor's Use	*NEW (Manual Entry)	Block Number		Contractor's Use	*NEW (Manual Entry)
					Description		Contractor's Use	Manual Entry				
					Function		Contractor's Use	Manual Entry				

### NOTES:

- a. All objects are to be modelled regardless if they are Precast / Cast-in-Situ / etc. Thus, Household-Shelters, Service Duct, Trucking, etc. are to be modelled in its equivalent existence such as Walls.
- b. All Architectural Elements modelled are to be checked against the PRECAST MODEL as well as STRUCTURAL MODEL for consistency in size, location and properties.

## 1.1.3 Core Information for Structural Objects

Building Element	Pile				Pile Cap				Column			
BIM Object	Isolated Foundation				Isolated Foundation Structural Foundation: Wall Structural Foundation: Slab				Column			
Modelling Requirements	<ul style="list-style-type: none"> <li>Model the piles separately from the pile cap for non-standard types of piles.</li> <li>Model the piles to the design intent length.</li> </ul>				<ul style="list-style-type: none"> <li>Foundation shall be modelled to the exact dimension and levels.</li> </ul>				<ul style="list-style-type: none"> <li>Model the structural column individually for each storey.</li> <li>Model the columns from SFL to SFL of floor above.</li> <li>Model the stumps (portion between the pile cap/footing and level 1 column) separately.</li> <li>Include drop panel, corbel, etc...</li> <li>Use library/objects for non-standard columns. Avoid using model-in-place.</li> </ul>			
2D View Requirement	<ul style="list-style-type: none"> <li>Plans showing the location of each pile for setting out</li> <li>Schedules or details with reinforcement information</li> <li>Connection details</li> </ul>				<ul style="list-style-type: none"> <li>Plans showing the location of each pilecap with identification for setting out</li> <li>Schedules or details with reinforcement information</li> <li>Connection details</li> </ul>				<ul style="list-style-type: none"> <li>Plan showing the location of each column with identification for setting out</li> <li>Schedules or details with reinforcement information</li> <li>Connection details</li> </ul>			
Parameters	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks
Default Non-Geometric Parameter (Required for placing the elements in the model)												
	ID		Identification		ID		Identification		ID		Identification	
	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name
Default Geometric Parameter (Required for placing the elements in the model)												
	Level		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>	Based on AMSL to calculate pile cut-off level	Level		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>		Base Level		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>	
	Offset		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>		Height Offset From Level		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>		Base Offset		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>	
	Dimensions		<ul style="list-style-type: none"> <li>Costing</li> <li>Coordination</li> <li>CBP</li> </ul>	Diameter x Length	Dimensions		<ul style="list-style-type: none"> <li>Costing</li> <li>Coordination</li> <li>CBP</li> </ul>	Length x Width x Thickness	Top Level		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>	
									Top Offset		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>	
									Dimensions		<ul style="list-style-type: none"> <li>Costing</li> <li>Coordination</li> <li>CBP</li> </ul>	Diameter x Height or Length x Width x Height
Manual Entry												
	Embedment		<ul style="list-style-type: none"> <li>Costing</li> <li>CBP</li> </ul>		Construction Method	Refer to Data Dictionary	<ul style="list-style-type: none"> <li>Costing</li> <li>Contractor's Use</li> </ul>	*NEW	Construction Method	Refer to Data Dictionary	<ul style="list-style-type: none"> <li>Costing</li> <li>Contractor's Use</li> </ul>	*NEW
	Depth		<ul style="list-style-type: none"> <li>Costing</li> <li>Coordination</li> <li>CBP</li> </ul>									
	Pile Type	Refer to Data Dictionary	<ul style="list-style-type: none"> <li>Costing</li> <li>Coordination</li> <li>CBP</li> </ul>	*NEW								
Calculated												
	Pile Cut-off Level		Setting Out	*NEW (Calculated by Main Contractor based on Level and Offset)								
Optional												
	Loading		Contractor's Use	*NEW (Manual Entry)	Block Number		Contractor's Use	*NEW (Manual Entry)	Block Number		Contractor's Use	*NEW (Manual Entry)
	Concrete Grade		Costing	*NEW (Manual Entry)	Number of Piles		Contractor's Use	*NEW (Manual Entry)	Properties Type	Refer to Data Dictionary	Contractor's Use	*NEW (Manual Entry)
					Loading		Contractor's Use	*NEW (Manual Entry)	Unit Type		Contractor's Use	*NEW (Manual Entry)
					Concrete Grade		Costing	*NEW (Manual Entry)	Loading		Contractor's Use	*NEW (Manual Entry)
									Concrete Grade		Contracting	*NEW (Manual Entry)
									Column Schedule Ref.		Contractor's Use	*NEW (Manual Entry)

## I.1.3 Core Information for Structural Objects

Building Element	Beam (including capping beam)				Floor/Slab				Wall			
BIM Object	Beam				Floor: Structural Floor: Slab Edge				Walls: Structural Wall Opening			
Modelling Requirements	<ul style="list-style-type: none"> <li>Model the beams from and to the centre of the column.</li> <li>Join beams to slabs (clear the connections).</li> <li>Model beam haunches to designed dimensions.</li> <li>Model proper termination of beams.</li> <li>Model structural openings, if any.</li> </ul>				<ul style="list-style-type: none"> <li>Model the structural floors at SFL.</li> <li>Model slabs as individual elements from beams after tender award.</li> <li>Openings to be modelled on floor. Not to use special tools to create the openings. E.g. Shafts Voids, etc.</li> <li>Model hollow-core slabs.</li> <li>Model structural foundation slabs.</li> <li>Model the slab edges with the exact profile.</li> <li>Show direction of span in model for one-way span.</li> <li>Optional: Model the recesses, kerbs, pads, trenches, cut-off drains, slab drops.</li> </ul>				<ul style="list-style-type: none"> <li>Model the structural walls from SFL to the SFL of floor above.</li> <li>Model structural foundation wall where necessary.</li> <li>Model openings using the Wall Opening tool, not by editing the wall's elevation profile.</li> </ul>			
2D View Requirement	<ul style="list-style-type: none"> <li>Plan showing the location of each beam with identification for setting out</li> <li>Indicate beam drops in plan view</li> <li>Schedules or details with reinforcement information</li> <li>Connection details</li> </ul>				<ul style="list-style-type: none"> <li>Plans showing the location of each slab with identification</li> <li>Plans showing reinforcement information</li> <li>Loading Plan</li> </ul>				<ul style="list-style-type: none"> <li>Plans showing the location of each wall with identification for setting out</li> <li>Schedules or details with reinforcement information</li> <li>Connection details</li> </ul>			
Parameters	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks
<b>Default Non-Geometric Parameter (Required for placing the elements in the model)</b>												
	ID		Identification		ID		Identification		ID		Identification	
	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name
<b>Default Geometric Parameter (Required for placing the elements in the model)</b>												
	Reference Level		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>		Level		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>		Base Constraint		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>	
	Start Level Offset		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>		Height Offset From Level		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>		Base Offset		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>	
	End Level Offset		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>		Dimensions		<ul style="list-style-type: none"> <li>Costing</li> <li>Coordination</li> <li>CBP</li> </ul>	Thickness	Top Constraint		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>	
	z-Offset Value		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>						Top Offset		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>	
	Dimensions		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> <li>CBP</li> </ul>	Length x Width x Depth					Dimensions		<ul style="list-style-type: none"> <li>Costing</li> <li>Coordination</li> <li>CBP</li> </ul>	Height Thickness Length
<b>Manual Entry</b>												
	Construction Method	Refer to Data Dictionary	<ul style="list-style-type: none"> <li>Costing</li> <li>Contractor's Use</li> </ul>	*NEW	Span Direction	<ul style="list-style-type: none"> <li>One</li> <li>Two</li> </ul>	Contractor's Use	*NEW	Construction Method	Refer to Data Dictionary	<ul style="list-style-type: none"> <li>Costing</li> <li>Contractor's Use</li> </ul>	*NEW
					Construction Method	Refer to Data Dictionary	<ul style="list-style-type: none"> <li>Costing</li> <li>Contractor's Use</li> </ul>	*NEW				
<b>Calculated</b>												
<b>Optional</b>												
	Block Number		Contractor's Use	*NEW (Manual Entry)	Block Number		Contractor's Use	*NEW (Manual Entry)	Function		Contractor's Use	Manual Entry
	Properties Type	Refer to Data Dictionary	Contractor's Use	*NEW (Manual Entry)	Properties Type	Refer to Data Dictionary	Contractor's Use	*NEW (Manual Entry)	Block Number		Contractor's Use	*NEW (Manual Entry)
	Unit Type		Contractor's Use	*NEW (Manual Entry)	Unit Type		Contractor's Use	*NEW (Manual Entry)	Unit Type		Contractor's Use	*NEW (Manual Entry)
	Concrete Grade		Costing	*NEW (Manual Entry)	Concrete Grade		Costing	*NEW (Manual Entry)	Concrete Grade		Costing	*NEW (Manual Entry)

## I.1.3 Core Information for Structural Objects

<b>Building Element</b>	<b>Staircase</b>			
<b>BIM Object</b>	Stair			
<b>Modelling Requirements</b>				
<b>2D View Requirement</b>	<ul style="list-style-type: none"> <li>Plans showing the location of each ramp/stair with identification for setting out</li> <li>Detail with reinforcement information</li> </ul>			
<b>Parameters</b>	<b>Name</b>	<b>Data List</b>	<b>Purpose</b>	<b>Remarks</b>
<b>Default Non-Geometric Parameter (Required for placing the elements in the model)</b>				
	ID		Identification	
	Name		Identification	Family Name/Type Name/Object Name
<b>Default Geometric Parameter (Required for placing the elements in the model)</b>				
	Base Level		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>	
	Base Offset		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>	
	Top Level		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>	
	Top Offset		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> </ul>	
	Maximum Riser Height		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> <li>Shop Drawing</li> </ul>	
	Minimum Run Width		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> <li>Shop Drawing</li> </ul>	
	Number of Risers		<ul style="list-style-type: none"> <li>Setting Out</li> <li>Coordination</li> <li>Shop Drawing</li> </ul>	
<b>Manual Entry</b>				
	Construction Method	Refer to Data Dictionary	<ul style="list-style-type: none"> <li>Costing</li> <li>Contractor's Use</li> </ul>	*NEW
<b>Calculated</b>				
<b>Optional</b>				
	Block Number		Contractor's Use	*NEW (Manual Entry)
	Concrete Grade		Costing	*NEW (Manual Entry)

### NOTES:

- Concrete Grade is an optional parameter as Consultants generally indicate the Concrete Grade in the form of 'Notes'.
- Use the recommended BIM Objects to model the elements. E.g. do not use Slab or Floor to model Beam.



## I.1.4 Core Information for MEP Objects

### PIPEWORK

Building Element	Pipe				Pipe Fitting (include elbows, tees, crosses, unions etc.)			
BIM Object	Pipe				Pipe Fitting			
Modelling Requirements								
2D View Requirement	Plans showing the location of each pipe for setting out							
Parameters	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks
<b>Default Non-Geometric Parameter (Required for placing the elements in the model)</b>								
	ID		Identification		ID		Identification	
	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name
<b>Default Geometric Parameter (Required for placing the elements in the model)</b>								
	Reference Level		Coordination		Level		Coordination	
	Offset		Coordination		Offset		Coordination	
	Slope		Coordination		Size		<ul style="list-style-type: none"> <li>Costing</li> <li>Coordination</li> </ul>	
	Size		<ul style="list-style-type: none"> <li>Costing</li> <li>Coordination</li> </ul>	Diameter				
<b>Manual Entry</b>								
	System Type		<ul style="list-style-type: none"> <li>Coordination</li> <li>Contractor's Use</li> </ul>		System Classification		<ul style="list-style-type: none"> <li>Coordination</li> <li>Contractor's Use</li> </ul>	
	Pipe Segment		Costing					
	Material		Costing					
	Insulation Size		Costing					
<b>Calculated</b>								
<b>Optional</b>								

## I.1.4 Core Information for MEP Objects

### PLUMBING FIXTURE

<b>Building Element</b>	<b>Plumbing Fixture</b>			
<b>BIM Object</b>	Plumbing Fixture			
<b>Modelling Requirements</b>				
<b>2D View Requirement</b>	Plans showing the location of each fixture with identification			
<b>Parameters</b>	<b>Name</b>	<b>Data List</b>	<b>Purpose</b>	<b>Remarks</b>
<b>Default Non-Geometric Parameter (Required for placing the elements in the model)</b>				
	ID		Identification	
	Name		Identification	Family Name/Type Name/Object Name
<b>Default Geometric Parameter (Required for placing the elements in the model)</b>				
	Level		Coordination	
	Elevation/Offset		Coordination	
	Dimensions		Costing	
<b>Manual Entry</b>				
	System Classification		Contractor's Use	
	Pipe Connector		<ul style="list-style-type: none"> <li>• Costing</li> <li>• Coordination</li> </ul>	*NEW
<b>Calculated</b>				
<b>Optional</b>				

## I.1.4 Core Information for MEP Objects

### FIRE PROTECTION

<b>Building Element</b>	<b>Sprinkler</b>			
<b>BIM Object</b>	Sprinkler			
<b>Modelling Requirements</b>				
<b>2D View Requirement</b>	Plans showing the location of each sprinkler with identification			
<b>Parameters</b>	<b>Name</b>	<b>Data List</b>	<b>Purpose</b>	<b>Remarks</b>
<b>Default Non-Geometric Parameter (Required for placing the elements in the model)</b>				
	ID		Identification	
	Name		Identification	Family Name/Type Name/Object Name
<b>Default Geometric Parameter (Required for placing the elements in the model)</b>				
	Offset		Setting Out	
<b>Manual Entry</b>				
	System Classification		Contractor's Use	
	Sprinkler Type		Contractor's Use	*NEW (Type Name)
	Pipe Connector		<ul style="list-style-type: none"> <li>• Costing</li> <li>• Coordination</li> </ul>	*NEW
<b>Calculated</b>				
<b>Optional</b>				

## I.1.4 Core Information for MEP Objects

### ELECTRICAL

Building Element	Cable Tray / Trunking / Ladder				Conduit				Electrical Equipment (includes panels and switchgears)			
BIM Object	Cable Tray				Conduit				Electrical Equipment			
Modelling Requirements												
2D View Requirement	Plans showing the location of the cable tray, trunking and ladder				Plans showing the location of the conduit				Plans showing the location of the electrical equipment with identification			
Parameters	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks
Default Non-Geometric Parameter (Required for placing the elements in the model)												
	ID		Identification		ID		Identification		ID		Identification	
	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name
Default Geometric Parameter (Required for placing the elements in the model)												
	Reference Level		Coordination		Reference Level		Coordination		Offset		Coordination	
	Offset		Coordination		Offset		Coordination		Dimensions		Coordination	
	Dimensions		• Costing • Coordination	Width x Height	Dimensions		• Costing • Coordination	Diameter Length				
Manual Entry												
	Fittings		• Costing • Coordination	Bends, Tee, Cross, Transition, Union	Fittings		• Costing • Coordination	Bends, Tee, Cross, Transition, Union	Load Classification		Contractor's Use	*NEW
					Conduit Type			Contractor's Use	Type Name			
Calculated												
Optional												

## I.1.4 Core Information for MEP Objects

### ELECTRICAL

Building Element	Electrical Device (include receptacles, junction boxes and other power devices)				Electrical Device (include intercom system components)				Electrical Device (include data devices e.g. Ethernet and other network connections)			
BIM Object	Electrical Fixture				Communication				Data			
Modelling Requirements												
2D View Requirement	Plans showing the location of the electrical device with identification				Plans showing the location of the electrical device with identification				Plans showing the location of the electrical device with identification			
Parameters	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks
<b>Default Non-Geometric Parameter (Required for placing the elements in the model)</b>												
	ID		Identification		ID		Identification		ID		Identification	
	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name
<b>Default Geometric Parameter (Required for placing the elements in the model)</b>												
	Elevation		Coordination		Elevation		Coordination		Elevation		Coordination	
	Dimensions		Coordination	If Applicable	Dimensions		Coordination	If Applicable	Dimensions		Coordination	If Applicable
<b>Manual Entry</b>												
	Load Classification		Contractor's Use	*NEW								
<b>Calculated</b>												
<b>Optional</b>												

## I.1.4 Core Information for MEP Objects

### ELECTRICAL

Building Element	Electrical Device (include fire alarm devices such as smoke detectors, manual pull stations and annunciators)				Electrical Device (include daylight sensors, occupancy sensors and manual switches)				Electrical Device (include security devices such as door locks, motion sensors and surveillance cameras)			
BIM Object	Fire Alarm				Lighting Switch				Security			
Modelling Requirements	Plans showing the location of the electrical device with identification				Plans showing the location of the electrical device with identification				Plans showing the location of the electrical device with identification			
2D View Requirement	Plans showing the location of the electrical device with identification				Plans showing the location of the electrical device with identification				Plans showing the location of the electrical device with identification			
Parameters	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks
<b>Default Non-Geometric Parameter (Required for placing the elements in the model)</b>												
	ID		Identification		ID		Identification		ID		Identification	
	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name
<b>Default Geometric Parameter (Required for placing the elements in the model)</b>												
	Elevation		Coordination		Elevation		Coordination		Elevation		Coordination	
	Dimensions		Coordination	If Applicable	Dimensions		Coordination	If Applicable	Dimensions		Coordination	Dimensions
<b>Manual Entry</b>												
<b>Calculated</b>												
<b>Optional</b>												

## I.1.4 Core Information for MEP Objects

### ELECTRICAL

Building Element	Electrical Device				Lighting Fixture			
BIM Object	Telephone				Lighting Fixture			
Modelling Requirements								
2D View Requirement	Plans showing the location of the electrical device with identification				Plans showing the location of the electrical device with identification			
Parameters	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks
<b>Default Non-Geometric Parameter (Required for placing the elements in the model)</b>								
	ID		Identification		ID		Identification	
	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name
	Elevation		Coordination		Elevation		Coordination	
	Dimensions		Coordination	If Applicable	Dimensions		Coordination	If Applicable
<b>Manual Entry</b>								
					Load Classification		Contractor's Use	*NEW
<b>Calculated</b>								
<b>Optional</b>								

## I.1.4 Core Information for MEP Objects

### ACMV

Building Element	Duct				Air Terminal				Mechanical Equipment (include pumps and pressure tanks)			
BIM Object	Duct				Air Terminal				Mechanical Equipment			
Modelling Requirements												
2D View Requirement	Plans showing the location of each air terminal with identification for setting out				Plans showing the location of each air terminal with identification for setting out				Plans showing the location of each mechanical equipment with identification			
Parameters	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks	Name	Data List	Purpose	Remarks
<b>Default Non-Geometric Parameter (Required for placing the elements in the model)</b>												
	ID		Identification		ID		Identification		ID		Identification	
	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name	Name		Identification	Family Name/Type Name/Object Name
					System Classification		Coordination		System Classification		Coordination	
<b>Default Geometric Parameter (Required for placing the elements in the model)</b>												
	Reference Level		Coordination		Level		Coordination		Offset		Coordination	
	Offset		Coordination		Offset		Coordination		Dimensions		Coordination	
	Dimensions		<ul style="list-style-type: none"> <li>Costing</li> <li>Coordination</li> </ul>	Width x Height	Dimensions		<ul style="list-style-type: none"> <li>Costing</li> <li>Coordination</li> </ul>	Width x Height				
<b>Manual Entry</b>												
	System Type		Coordination						Electrical Load		Contractor's Use	
<b>Calculated</b>												
	Bottom Elevation		Coordination									
<b>Optional</b>												
	Mechanical Flow		Contractor's Use	Manual Entry	Mechanical Flow		Contractor's Use	Manual Entry	Mechanical Flow		Contractor's Use	Manual Entry



## I.1.5 Data Dictionary for Core Information Data List

ATTRIBUTE	DATA LIST	DEFINITION OF TERM
<b>Type of Pile</b>	Bored	Bored Pile
	Composite	Composite Pile
	Micro	Micro Pile
	PC	Precast Pile
	Sheet	Sheet Pile
<b>Construction Method</b>	CIS	Cast-In-Situ
	Composite	Composite/Fabricated
	PC	Precast
<b>Properties Type</b>	Normal	---
	Prestressed	---
	RC	Reinforced Concrete

## I.1.6 Classification for MEP Disciplines and Sub-Disciplines

The table below shows the classification for MEP disciplines and sub-disciplines to be used when modelling MEP objects to ensure consistency.

DISCIPLINE	SUB-DISCIPLINE	ABBREVIATION
<b>PLUMBING</b>	Cold Water Supply	<b>CWS</b>
	Hot Water Supply	<b>HWS</b>
	Sanitary	<b>SANITARY</b>
	Rain Water Down Pipe	<b>RWDP</b>
	Hose Reel	<b>HR</b>
	Wet Riser	<b>WR</b>
	Sprinkler System	<b>SPR</b>
	Gas	<b>GAS</b>
<b>ELECTRICAL</b>	Electrical Cable	<b>ECAB</b>
	Telecom	<b>TELECOM</b>
	Cable Tray	<b>CTRAY</b>
	Cable Ladder	<b>CLAD</b>
	Cable Trunking	<b>CTRUNK</b>
	Cable Enclosure	<b>CENCLOSE</b>
<b>MECHANICAL</b>	Fresh Air Duct	<b>FAD</b>
	Supply Air Duct	<b>SAD</b>
	Kitchen Fresh Air Duct	<b>KFAD</b>
	Kitchen Exhaust Air Duct	<b>KEAD</b>
	Exhaust Air Duct	<b>EAD</b>
	Return Air Duct	<b>RAD</b>
	Toilet Exhaust Air Duct	<b>TEAD</b>
	Toilet Return Air Duct	<b>TRAD</b>
	Condensing Water Supply	<b>CWS</b>
	Condensing Water Return	<b>CWR</b>

## I.1.7 MEP Pipe Material & Sizes for Housing Projects

The table below shows the MEP pipe material and sizes commonly used in new public housing developments.

### Note:

Please note that these are for reference only and shall not relieve the Qualified Person of his obligations and responsibilities in ensuring that the design complies fully with HDB's and all relevant authorities' requirements.

This information is compiled from the HDB Guide Drawings and HDB Building Specifications and is correct as of the 2014 version.

### Plumbing Pipework

SYSTEM TYPE	SIZE	MATERIAL (STANDARDS)	TYPES OF JOINTS (STANDARDS)
Cold Water	Ø80mm and above	Ductile Iron Cement Lined Pipe (BS EN 545)	PN16 ductile iron flange joints (BS EN 545)
	Ø54mm / Ø42mm	Stainless Steel Pipe (BS EN 10312:02)	Compression fittings of copper alloy (BS EN 1254 Part 2:1998) / Stainless steel press fitting joints (Japanese Waterworks Association G116)
Hot / Cold Water (within dwelling unit for sold flats)	Ø28mm / Ø22mm	Copper Pipe (BS EN 1057-R250)	Press-fitting joints (BS EN 1254 Part 2)
Hosereel Supply Tee-Off from Potable Water Tank	Ø54mm	Stainless Steel Pipe (BS EN 10312:02)	Compression fittings of copper alloy (BS EN 1254 Part 2:1998) / Stainless steel press fitting joints (Japanese Waterworks Association G116)

## Sanitary Pipework

Unless specified otherwise, all UPVC pipes and fittings provided for sanitary installations shall be in accordance with the following schedule:

SANITARY INSTALLATION (INCLUDING WASTE/RAIN WATER DOWN-PIPE SYSTEM)	TYPE OF PIPE/FITTING (SS: SINGAPORE STANDARD)			REMARKS
	SS 213	SS 141 Class D	SS 272	
Underground Sanitary Drainage System – Main/Branch Drain Lines			*	
Above Ground Sanitary Plumbing System (Soil/Waste to I/C):				Anti-Mosquitoes Devices, Socket Sleeves and Pipe Skirtings to be used. SS 213/SS 141 Adaptor to be used.
c. All except Void Decks	*			
d. Void Decks <ul style="list-style-type: none"> <li>Discharge stacks</li> <li>Discharge pipes &amp; fittings</li> </ul>	*	*		
Waste/Rain Water Down-Pipe System (RWDP):				Roof Outlet to be used.  Rectangular Section Fittings to be used.     SS 213/SS 141 Adaptor to be used.
a. 200 diameter pipes for RWDP system			* (White)	
b. Underground pipes/fittings for 200 diameter pipes (RWDP)				
c. Above ground pipes/fittings connected to 200 diameter RWDP system	*			
d. 50, 80, 100 & 150 diameter waste discharge (balcony, lift lobby, etc.) pipes/fittings:				
i. Above ground except void decks and MSCPs	*			
ii. Void decks and MSCPs <ul style="list-style-type: none"> <li>Down pipes</li> <li>Discharge pipes/fittings</li> <li>Underground pipes/fittings</li> </ul>	*	*	*	

\* Denotes the specified pipes/fittings.

APPLIANCE/FITTING TYPE	MINIMAL INTERNAL DIAMETER OF WASTE PIPE (mm)
Wash Basin	32
Kitchen Sink	40
Floor Trap	100
Floor Waste at Shower Area	50

## Gas Pipework

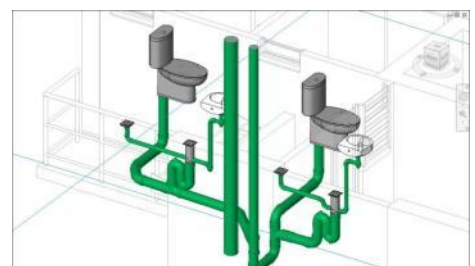
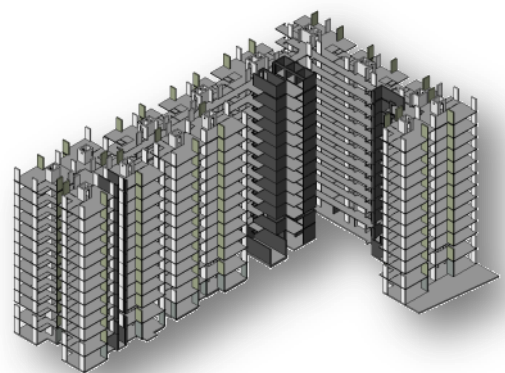
SYSTEM TYPE	SIZE	MATERIAL (STANDARDS)	TYPES OF JOINTS (STANDARDS)
Horizontal supply pipe outside dwelling unit/gas riser	Ø50mm and above	Galvanised steel pipes (SS 17 or BS 21)	Galvanised malleable cast iron pipe fittings (BS 143 and BS 1256)
Gas pipe (within dwelling unit)	Ø22mm	Copper Pipe (BS EN 1057)	Compression fittings of copper alloy (BS EN 1254 Part 2)

## Fire Protection Pipework

PIPE TYPE	SIZE	MATERIAL
Dry Riser Pipe	Ø150mm / Ø100mm	Galvanised Steel Pipes (BS 1387 or ASTM A120 and BS 1740)
Hosereel Pipe (at MSCP after hosereel tank)	Ø50mm / Ø25mm	Galvanised Steel Pipe (BS 1387)

# PART II

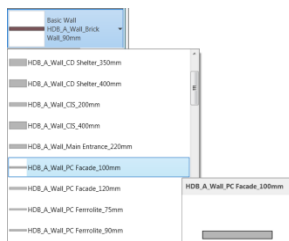
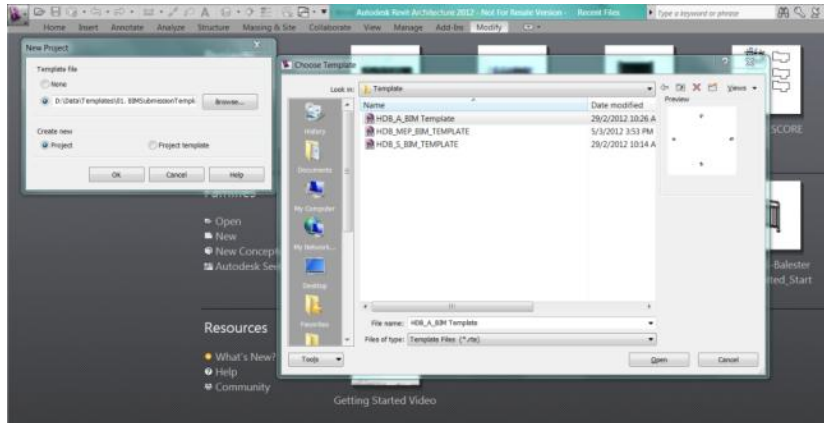
## STEP-BY-STEP MODELLING



## 5.0 GETTING STARTED IN MODELLING

### 5.1 Project Template

A project template provides a starting point for new project. One can start a project with BCA's BIM e-Submission template(s) or customise BCA's BIM e-Submission template(s) that incorporates their own office standards.



*Example: Wall Types*

HDB\_A\_Text\_P50-1\_113mm  
HDB\_A\_Text\_P50-2\_163mm  
HDB\_A\_Text\_P50-3\_238mm  
HDB\_A\_Text\_P100-1\_175mm  
HDB\_A\_Text\_P100-2\_225mm  
HDB\_A\_Text\_P100-3\_475mm  
HDB\_A\_Text\_P200-1\_350mm

*Example: Text Types*

The following settings can be customised in the template:

- Browser organization
- Views and View Template,
- System family types (Wall and Slab),
- Standard families (both 2D and 3D)
- Line types,
- Filters (for colour override),
- Text types (3 sizes per type for both 1:50 and 1:100 scales)
- Units,
- Dimension types,
- Tags,
- Keynotes,
- Symbols,
- Groups,
- Parameters,
- Fill types (Floor and Wall tile patterns),
- Schedules and
- Sheets

The template can be refined and improved during the course of the project to use for future projects.

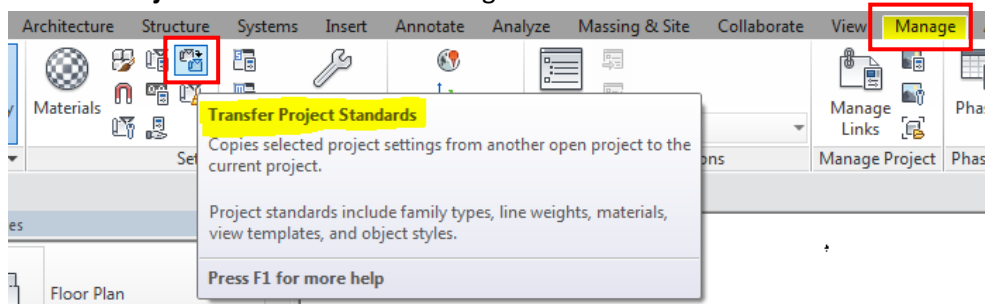
#### Note:

Setting up of the template is not in the scope of this document. Please refer to the software help file/manual to understand how to create the template file.

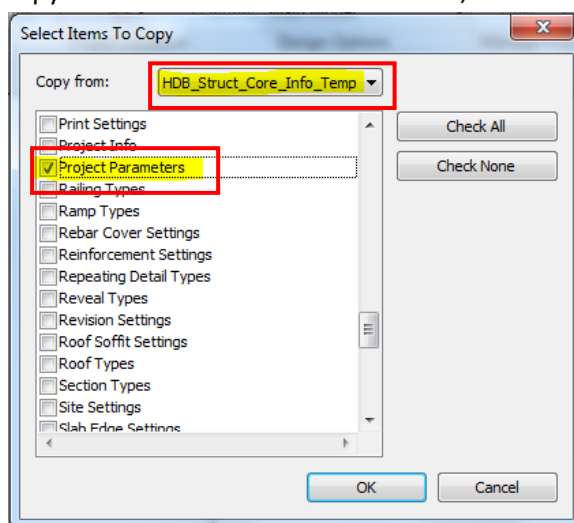
## 5.2 Transferring Parameters from HDB Core Info Templates

Consultants may transfer the core information parameters from the HDB sample core information templates to their own customised templates or project files as follows:

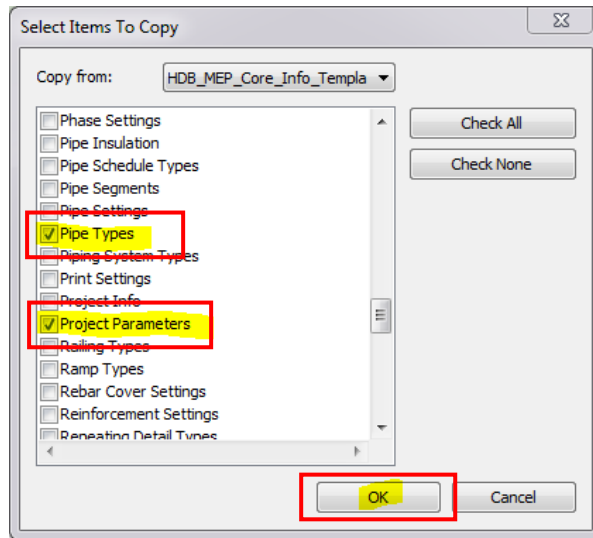
- Open both the HDB sample core information template and your own customised template or your project file.
- Go to your own customised template or project file. Under the **Manage** tab, select **Transfer Project Standards** under Settings.



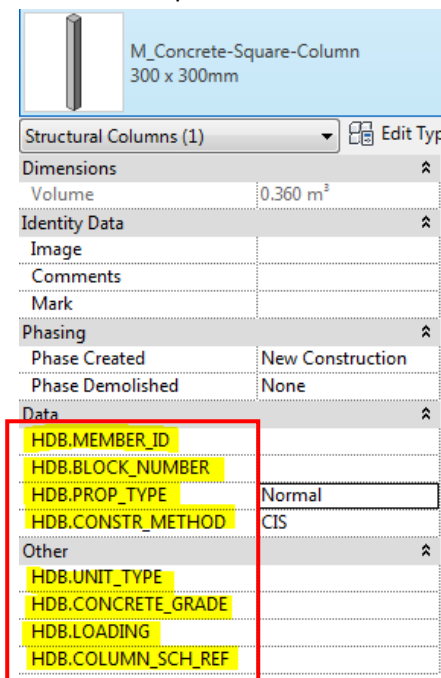
- In the **Select Items To Copy** dialog box, select the **HDB Core Information Template** to copy the standards from. From the list, select **Project Parameters**.



For MEP, the **Pipe Types** should also be selected to copy the MEP pipe material and sizes commonly used in new public housing developments from HDB sample core information templates to your own customised templates or project files, if so desired.



- d. Click OK to finish.
- e. Add an object e.g. Structural Column (in this example, the standards are being transferred from the HDB Structural Core Information Template) to the project. Click on the object and the Properties should show the parameters that have been transferred from the template.





## 5.3 Creating a Project Base Model

**Note:**

HDB's surveyor will provide the Consultants awarded the project with the 3D topographical CAD drawing (for reference) and the BIM Site Topo Model for the development of their own models.

However, HDB shall not be responsible for any costs, expenses, liabilities or damages which may result from the use of the CAD drawing and/or the BIM Site Topo Model.

It is recommended that a Project Base Model be created based on the BIM Site Topo Model provided by HDB's surveyor. The Project Base Model can be created using the BCA BIM e-Submission template or the company's own customised template, as discussed under the section 'Project Template'.

The Project Base Model should be created by the lead consultant at the start of the project, shared and used by the other project team members to create their respective parts or disciplines for the project. This model shall contain the following information and shall show the complete layout of the proposed site when all the other relevant portions or disciplines are linked to this master layout:

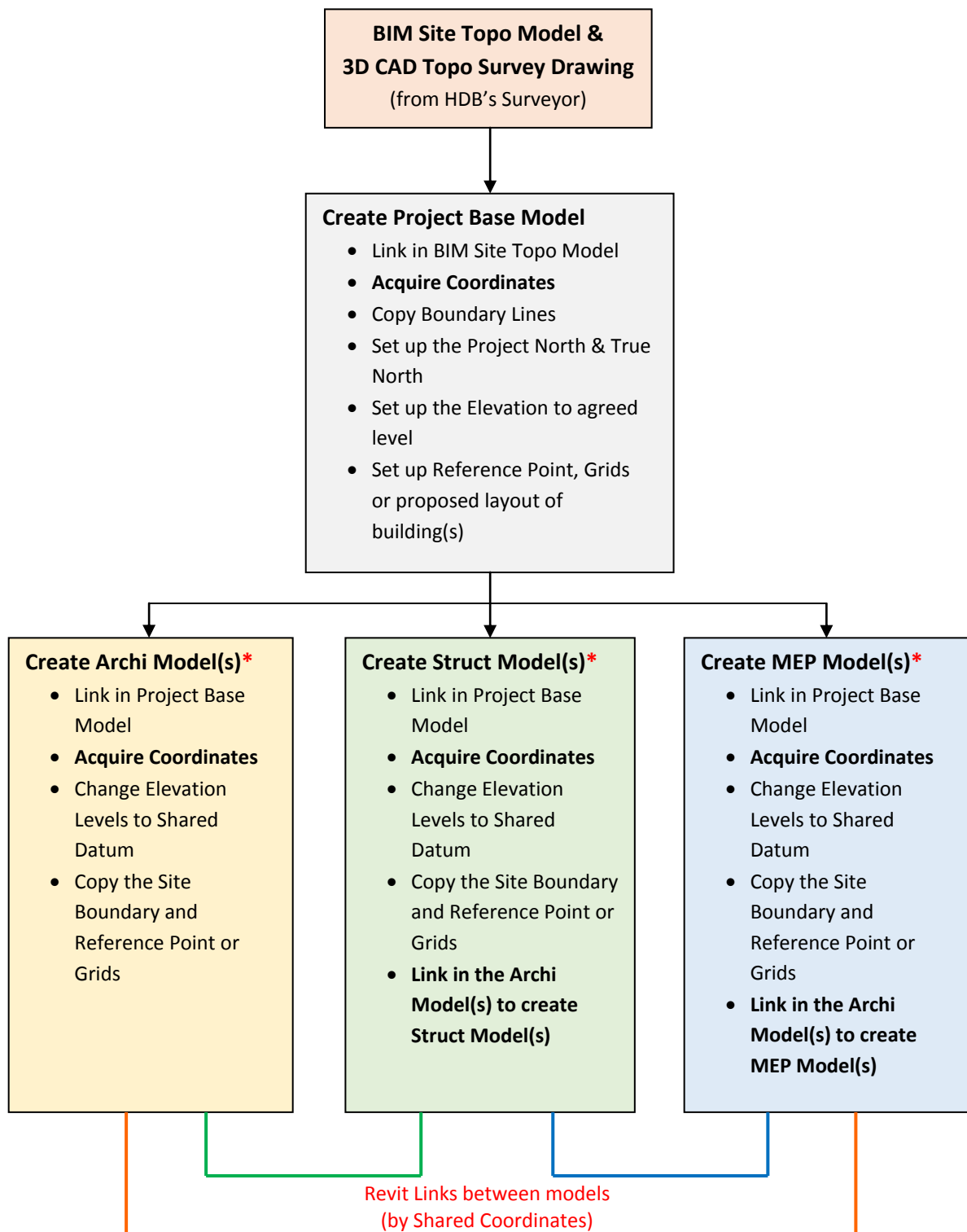
- Location of Site (as provided by Surveyor);
- Site Boundary;
- Orientation of Site according to True North;
- Setting out of the proposed building(s) or a common reference point or grids to locate the proposed building(s) in relation to the site;
- Proposed Platform Level or 1<sup>st</sup> Storey Level (Elevation) as agreed between the team members;
- Proposed Levels for all upper storeys based on structural floor levels of residential units.

It is recommended that the Structural and M&E teams set up their respective models using the Project Base Model as a common base first and inherit the coordinates and elevation from this model.

This is to ensure that subsequently when they link in the Architectural Model(s) to create their respective discipline models using **Shared Coordinates**, the different models will align correctly. When all the models are linked to the Project Base Model, the respective disciplines should also be properly aligned and orientated according to the True North for the project site.

**Overview of Suggested Workflow for Creating the Project Base Model and the various models for coordination:**

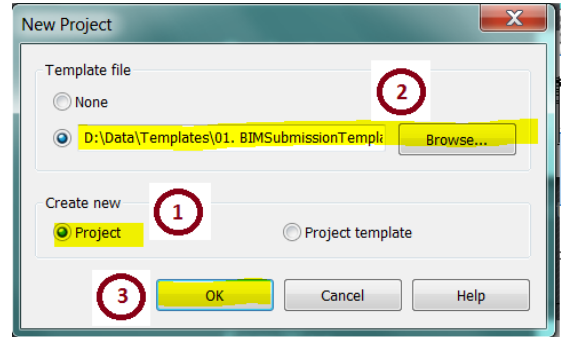
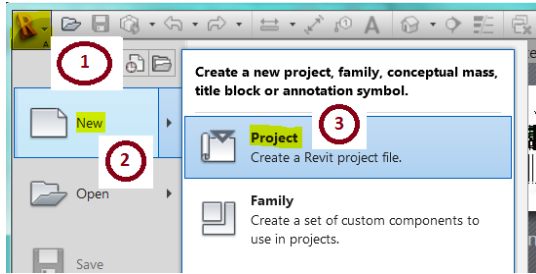
(Refer to the Steps for the details)



\* Models may be split into different blocks, depending on the size and complexity of project. Refer to the section on 'Modelling Plan' for more details.

## Step 1: Create a new Project Base Model from the Project Template

- From the Application Menu choose New → Project.
- In the **New Project** dialog box, choose **Project** under **Create new**.
- Click the **Browse...** button and locate the template file using the file dialog box.
- Click **OK** to create the new project.

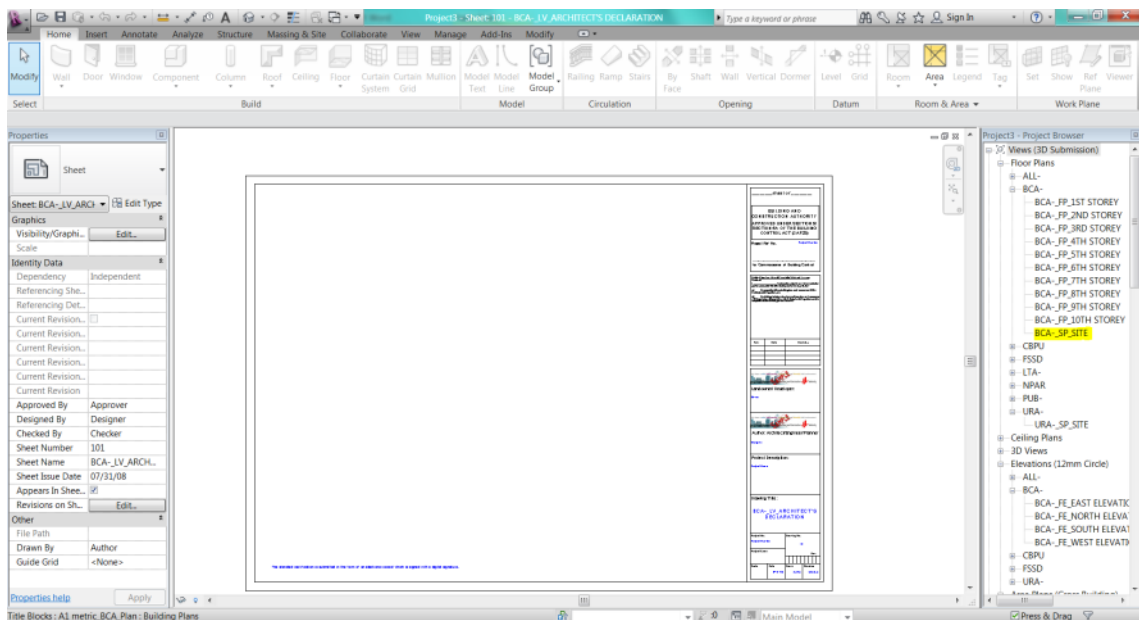


## Step 2: Acquire Coordinates from the BIM Site Topo Model

The new project created in **Step 1** is shown in the image below. Next, set up the **Location** and **Orientation** for the project. This is done by linking the **Surveyor's BIM Site Topo Model** into the **site plan view** and by acquiring the coordinates from the BIM Site Topo Model.

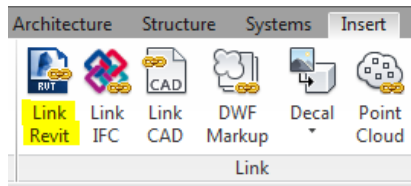
### Note:

The Surveyor's BIM Site Topo Model should have been set up to use a particular Survey Control Point as the Project Base Point so the new Project Base Model will acquire these coordinates from the BIM Site Topo Model.



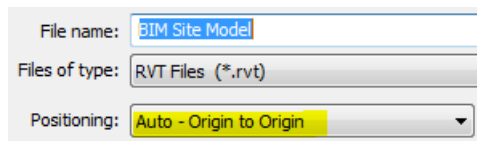
- a. Double-click on the view **BCA-\_SP\_SITE** to open the site plan view.


From the **Insert Tab** choose **Link Revit**.

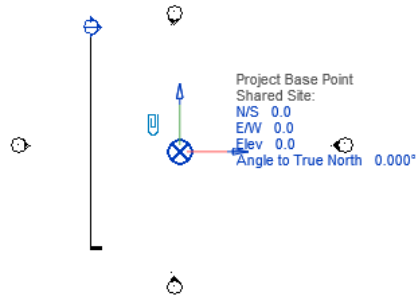
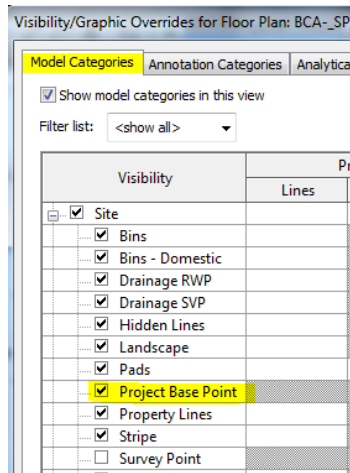



- b. In the **Import/Link RVT** dialog box, browse and locate the BIM Site Topo Model in RVT format.

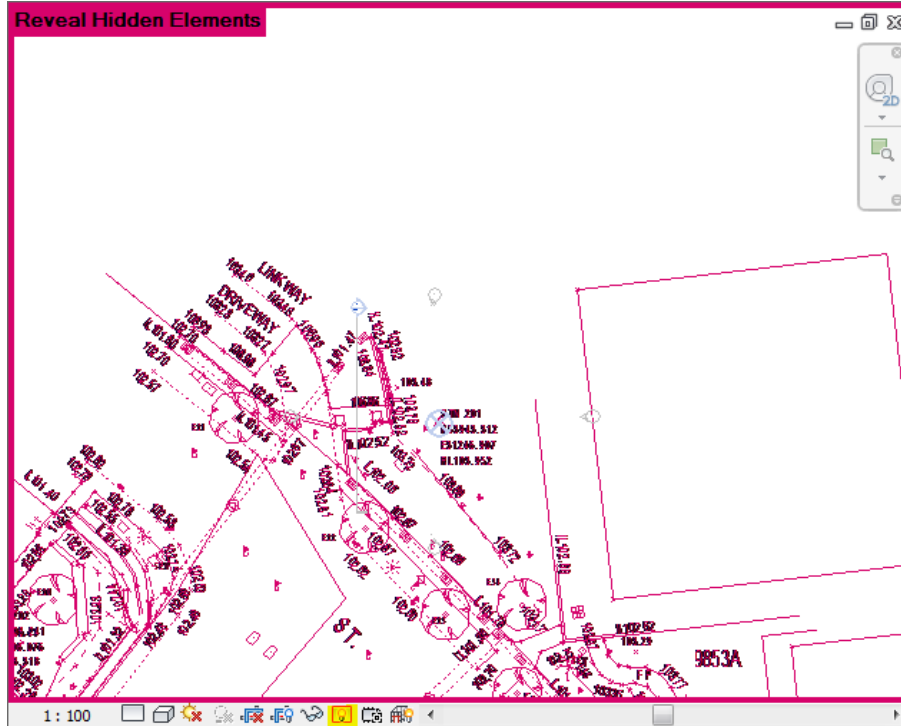
- c. Set the Positioning to **Auto - Origin to Origin** and click **Open**. This will place the topography of the project site in the site plan view in the location and orientation set by the Surveyor.



- d. Turn on the visibility of the **Project Base Point** under View -> **Visibility/ Graphics -> Model Categories -> Site**. The Project Base Point  shows the N/S and E/W coordinates to be 0.0.

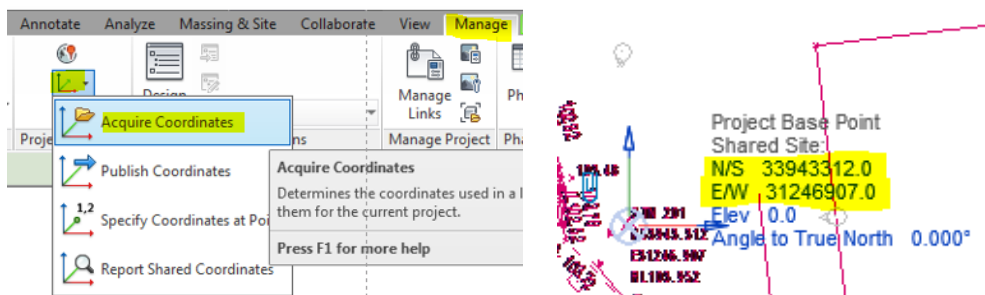


- e. You may not see anything in the drawing space even after linking the Revit BIM Site Topo Model.
- Click on **Reveal Hidden Elements**  in the **View Control Bar**. This should reveal the 3D CAD Topographical Survey drawing (which should have been linked to the BIM Site Topo Model) as shown in the image below.



Reveal Hidden Elements

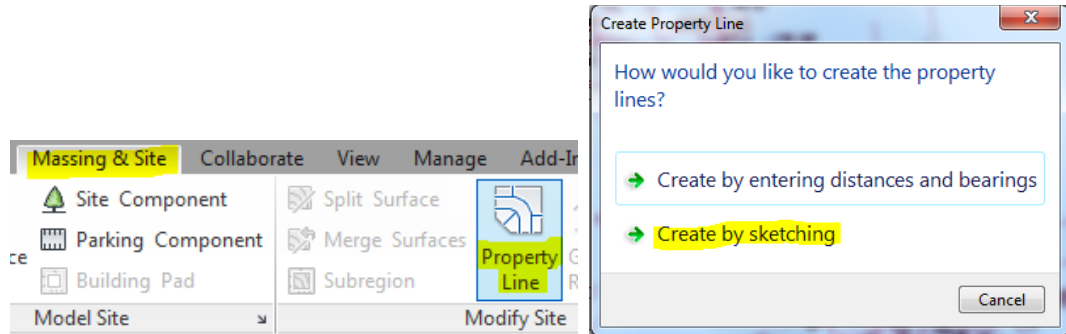
- f. Go to the **Manage** tab, Project Location -> Coordinates and select **Acquire Coordinates**. Pick the linked file as revealed above to acquire the coordinates. The Project Base Point now shows the same coordinates as the Survey Control Point set up as the Project Base Point in the BIM Site Topo Model.



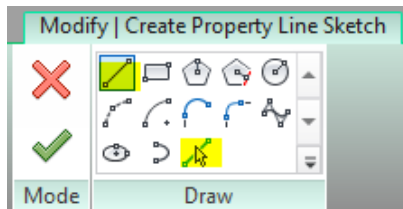
### Step 3: Copy the Boundary Lines from CAD Survey Drawing


With the 3D CAD Topographical Survey drawing still revealed, copy the boundary line from the drawing.

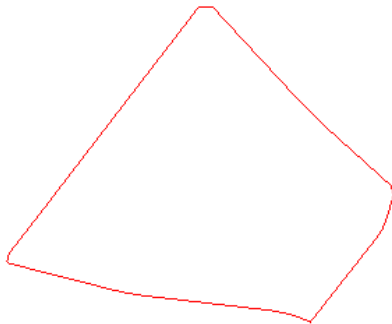
- a. Go to the **Massing & Site** tab, Modify Site -> **Property Line**. In the Create Property Line dialog, select **Create by sketching**.



- b. Use the **Line** or the **Pick Lines** tool to copy the boundary lines from the CAD drawing.



- c. Click on the **Reveal Hidden Elements**  in the **View Control Bar** again to hide the 3D CAD drawing if so desired.



#### Step 4: Set Up Orientation for Project

Next set up the orientation for the site. The survey drawing is normally based on the real world north (pointing upwards). Make sure that it is correct. However, it may not be convenient for the team to work in the real world north orientation. Revit offers **Project North** and **True North** as a solution.

- **True North** in Revit represents real world north orientation.
- **Project North** is specified by the user, which can be set for convenience to work on the building model. It is like rotating a paper to a convenient position to draw.

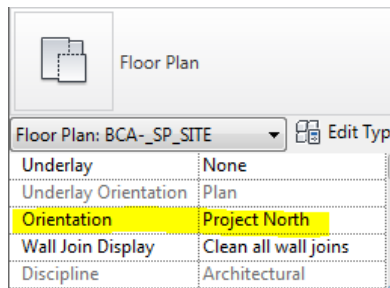
#### Note:

In Revit there is only one Project North per file. If there are multiple blocks, either one of the options described below could be used.

**Option 1:** Create individual files for each block, in which the Project North can be set differently for each of them. Link the files (blocks) to form the overall model. In this option the documentation should be done in the individual files.

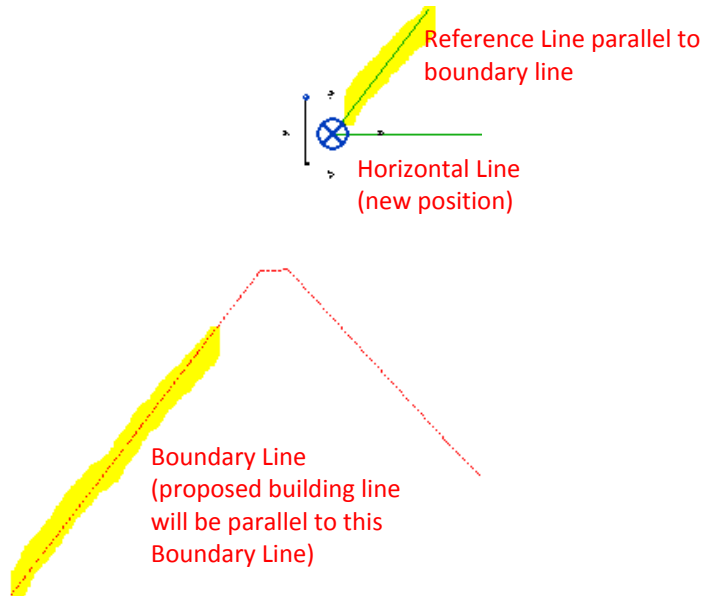
**Option 2:** This is done in the file containing the overall model. Set the Project North based on the key block in the project. For the rest of the blocks, create the plan views, enable the crop region, select and rotate the crop region to the convenient orientation.

- a. In the previous Step, the BIM Site Topo Model was linked to the new Project Base Model with the **Orientation** set at the default **Project North**.

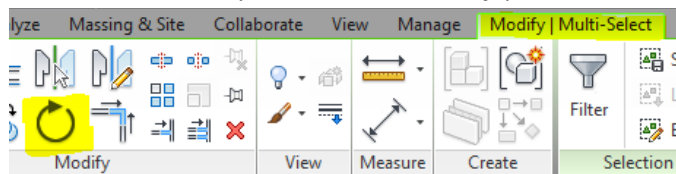


The Project Base Model has to be rotated to reflect the Project North. Select a boundary line that is parallel to the longitudinal side of the proposed building as a base for orientation. At the end of the settings that boundary line will be horizontal in the Project North.

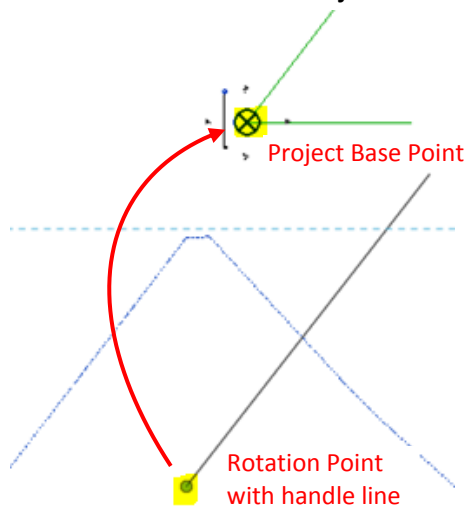
- b. Draw a line from the Project Base Point parallel to the site boundary that needs to be horizontal in the Project North. This line will be used as a **Reference Line** to set the orientation for the Project North.



- c. Select the Boundary Lines. In the **Modify | Multi-Select** tab, choose **Rotate**.

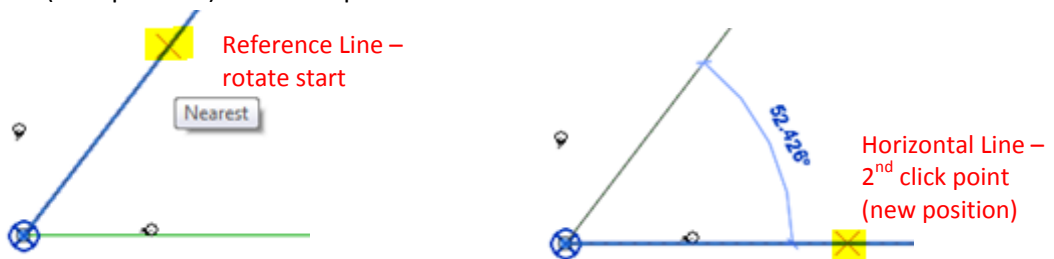


- d. A Rotation Point with a handle line will appear in the drawing area. Click on the **Rotation Point** and move it to the **Project Base Point**.

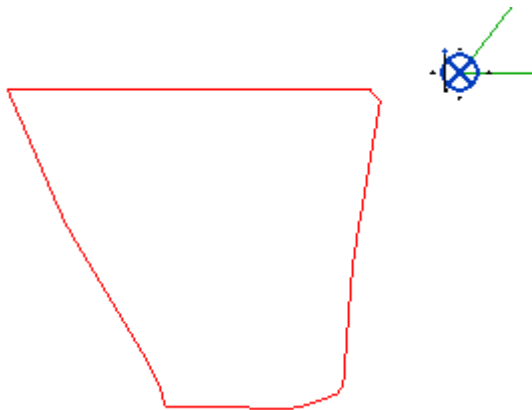




- e. Click a point along the **Reference Line** as the rotate start point and click on the **Horizontal Line** (new position) as the 2<sup>nd</sup> point.



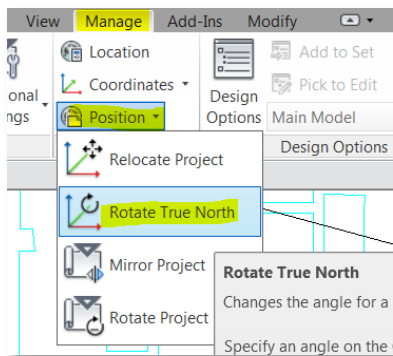
- f. The rotated project site will be as shown below.



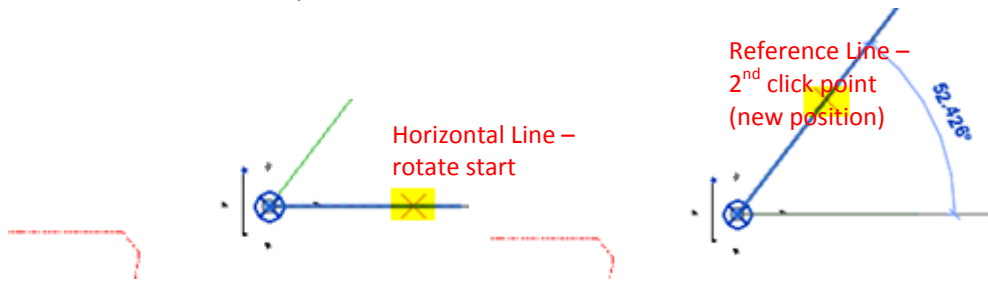
- g. Next the user needs to set **True North** for the project. Set the Properties -> **Orientation** of the view to **True North**.

Underlay Orientation	Plan
<b>Orientation</b>	<b>True North</b>
Wall Join Display	Clean all wall joins
Discipline	Architectural

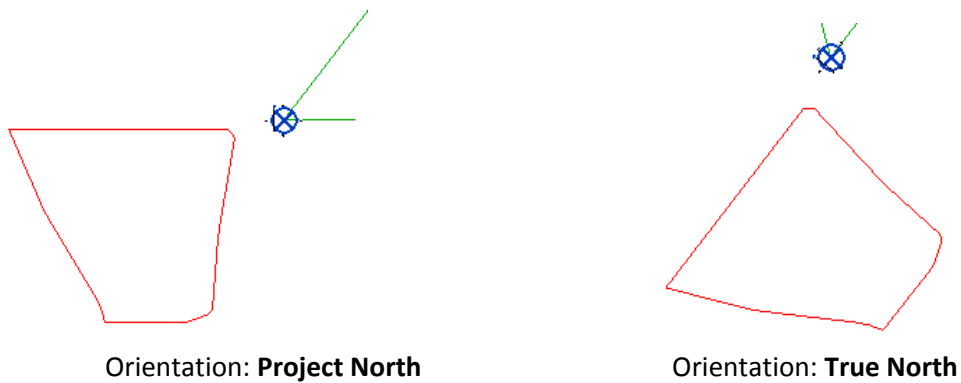
- h. Select both the Toposurface and the Boundary Lines again. Go to **Manage** tab, Project Location -> **Position** and **Rotate True North**.



- i. This time, pick the **Horizontal Line** as the rotate start first. Then click the 2<sup>nd</sup> point on the **Reference Line** (new position).



- j. Once both **Project North** and **True North** for the project are set, verify that they are set correctly by changing the **Orientation** property of the view.

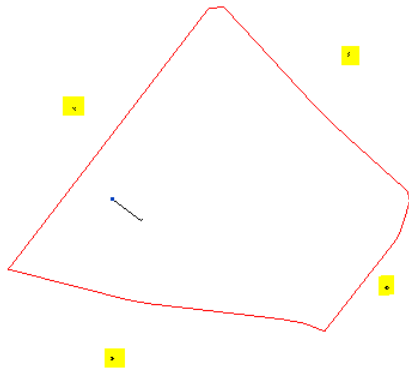


The Project Base Point now shows the **Angle to True North** as well.

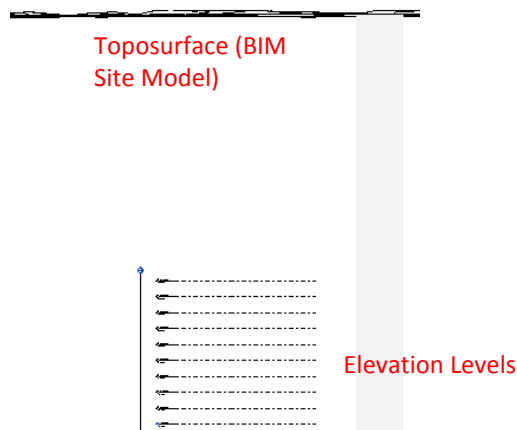


## Step 5: Set Up the Elevation Level to the Agreed Level

- a. Move the Elevation markers to outside of the project site if necessary.



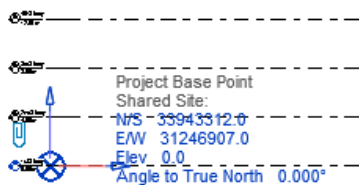
- b. Go to the Elevation view to set the level to the agreed 1<sup>st</sup> Storey Level for the project. The linked BIM Site Topo Model will show the toposurface “floating” above the Elevation levels as shown.



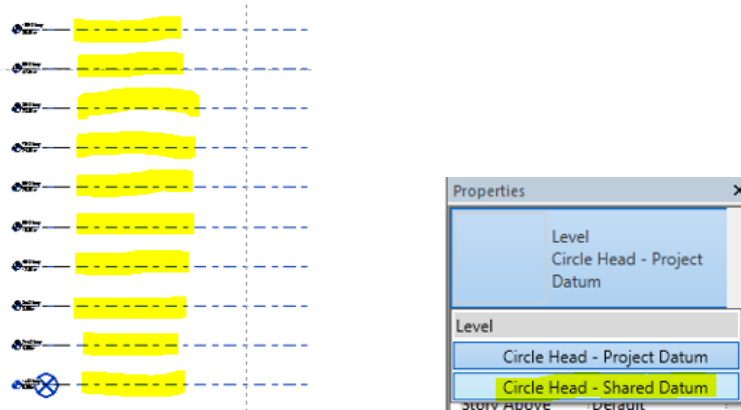
If the Elevation Levels cannot be seen, change the Properties -> **Far Clipping** of the view to **No clip**.



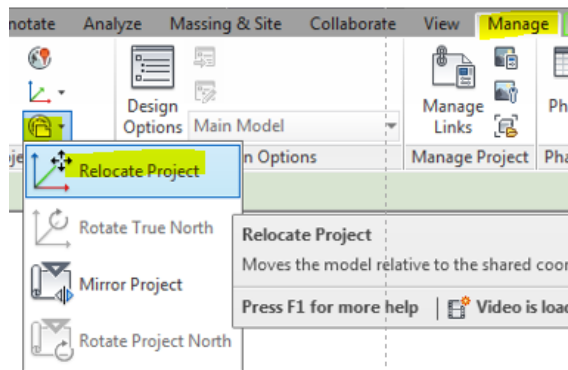
- c. Turn on the visibility of the Project Base Point. The Elev shows 0.0.



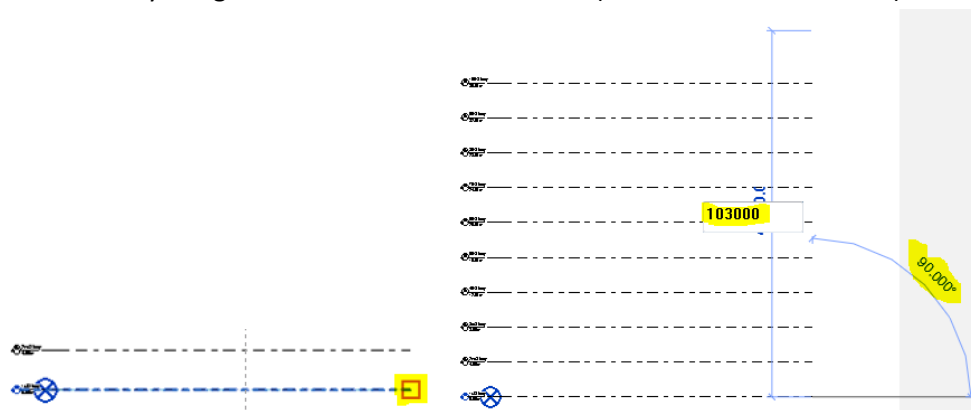
d. Select all the Levels and change the Properties to **Level Circle Head – Shared Datum**.



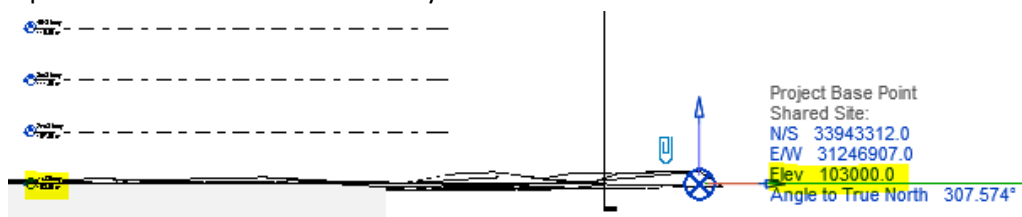
e. With the Levels still selected, go to Manage -> Project Location -> **Position** and select **Relocate Project**.



f. Pick the end point of the 1<sup>st</sup> Storey Level and enter the level of the 1<sup>st</sup> Storey Level in mm vertically as agreed between the Consultants (common reference level).

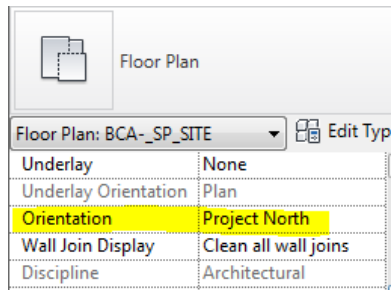


g. The 1<sup>st</sup> Storey is now set to the agreed level based on the AMSL notation. The topographic surface is also now set correctly.

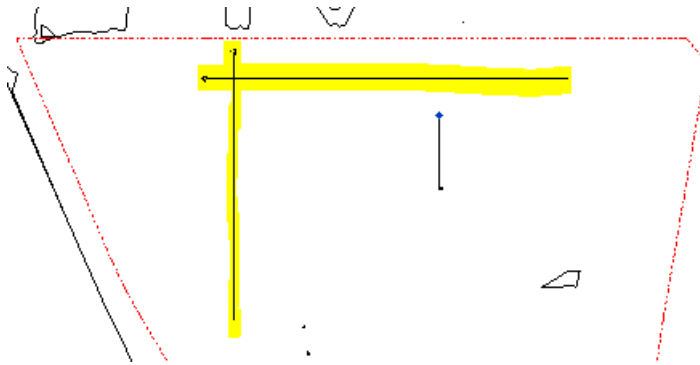


## Step 6: Set Up the Reference Grids, Point or Proposed Building Layout

- a. Go to the Site View and change the Properties -> **Orientation** to **Project North**.



- b. Create the **Reference Grids** or Point for the building layout e.g. one corner of the building. Set out the building layouts with the necessary building setbacks from the boundary lines as required.



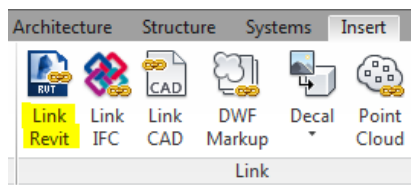
The Project Base Model should be distributed to the project team members as a common reference base model to set up the project

## 5.4 Creating Other Models

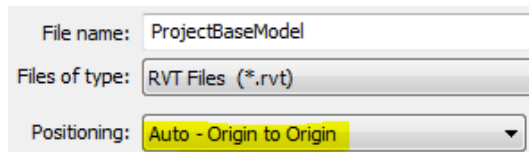
Once the Project Base Model has been created and set up properly, this can then form a basis for the creation of the other models e.g. Massing, Architectural, Structural and MEP Models. The other models can be created by linking in the Project Base Model and acquiring coordinates from the Project Base Model.

### Step 1: Create Other Models

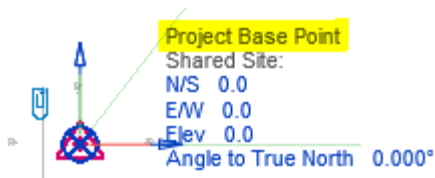
- Create a new project for the Archi Model as in Section 5.3, Step 1 of the Guide.
- Double-click on the view **BCA-\_FP\_1ST STOREY** to open the 1<sup>st</sup> Storey plan view.
- From the **Insert Tab** choose **Link Revit**.



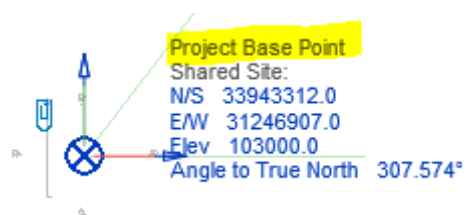
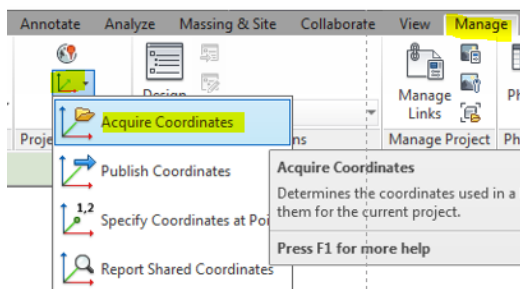
- In the **Import/Link RVT** dialog box, browse and locate the Project Base Model in RVT format. Set the Positioning to **Auto - Origin to Origin** and click **Open**.



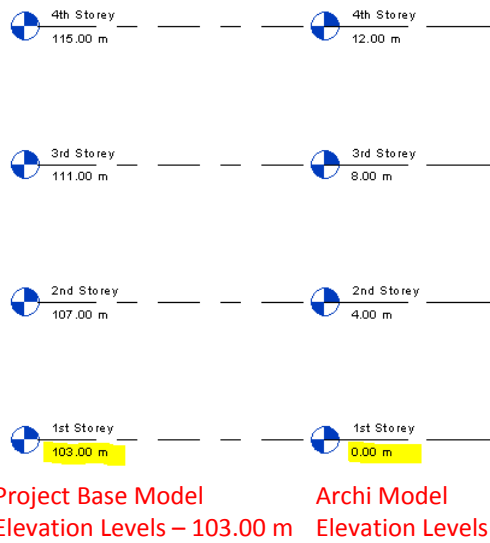
- Click on **Reveal Hidden Element** and the Project Base Point will be shown as 0.0.



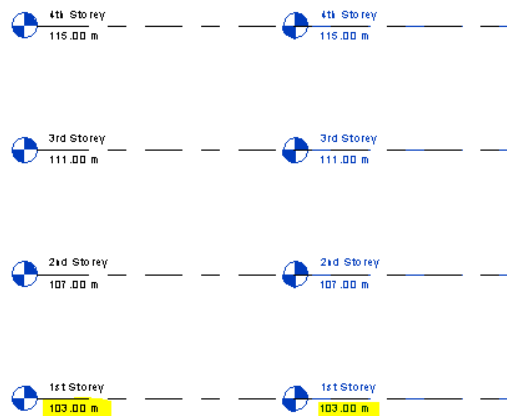
- Go to the **Manage** tab, Project Location -> Coordinates and select **Acquire Coordinates**. Pick the linked Project Base Model file to acquire the coordinates. The Project Base Point now shows the same coordinates as the Project Base Model.



- f. Go to the Elevation view. The Project Base Model's Elevation Levels and the Archi Model's Elevation Levels are as shown.



- g. Select all the Archi Model's Elevation Levels. Change the **Properties** to **Level Circle Head – Shared Datum**. The Archi Model's Elevation Levels will be changed to the same as that of the Project Base Model.



- h. Copy the Boundary Lines and the Reference Grids from the Project Base Model.
- i. Create the Structural and MEP Models using the same steps above. Now all the models should share the same coordinates, Project North, True North and Elevation Levels as the Project Base Model.

- j. Link in the Archi Model to the Structural and MEP Models using **Auto – By Shared Coordinates**. The Archi Model should be aligned with the MEP Model.

The Consultants can now proceed to create their respective models based on the Project Base Model settings and the Archi Model for the building layout

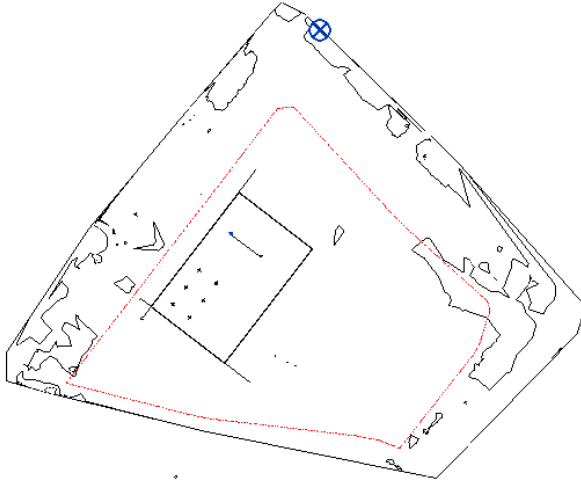
File name:	ArchiModel
Files of type:	RVT Files (*.rvt)
Positioning:	Auto - By Shared Coordinates

## Step 2: Link Models to Project Base Model

- a. Open the Project Base Model and link in required Models e.g. Archi and MEP, with **Positioning -> Auto – Shared Coordinates**.

File name:	ArchiModel	File name:	MEPModel
Files of type:	RVT Files (*.rvt)	Files of type:	RVT Files (*.rvt)
Positioning:	Auto - By Shared Coordinates	Positioning:	Auto - By Shared Coordinates

If done correctly, all the models when linked to the Project Base Model by Shared Coordinates should be aligned correctly.

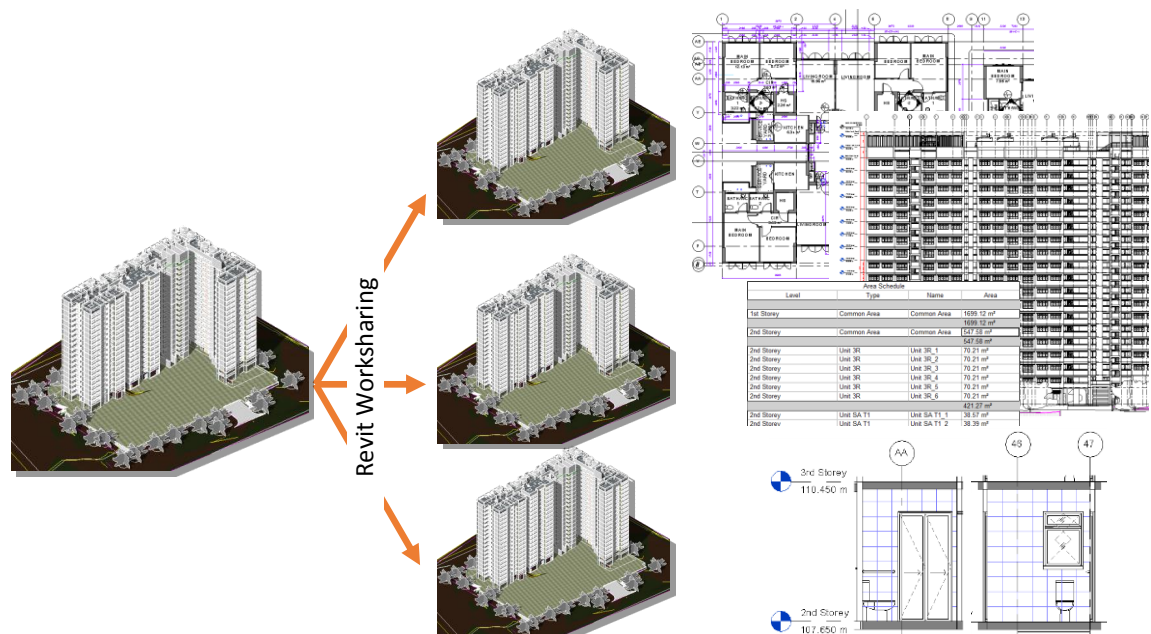
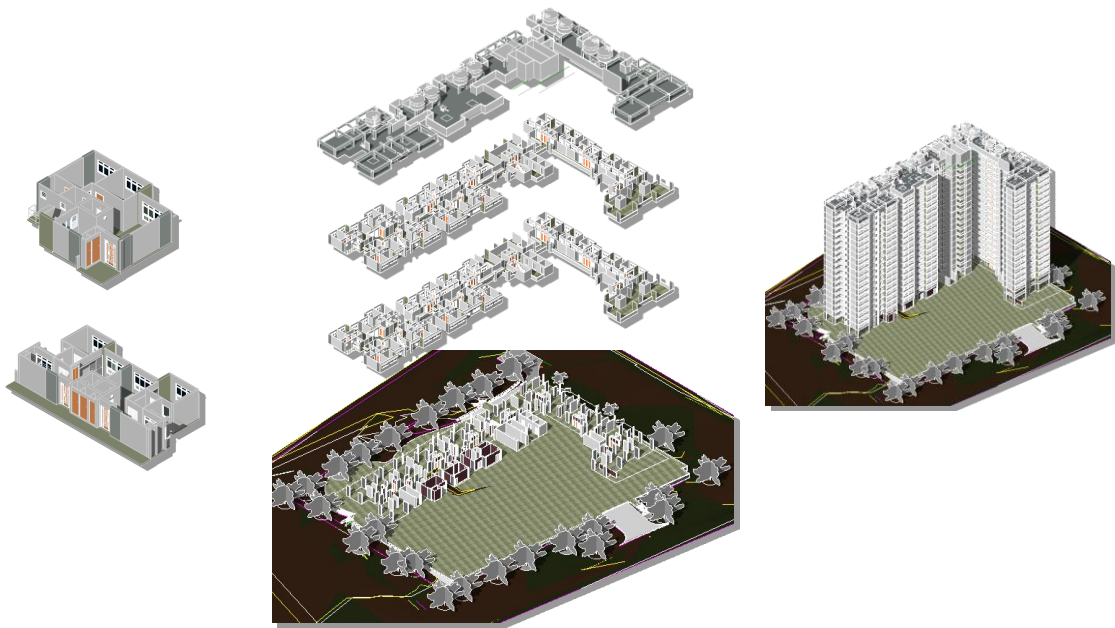




## 6.0 MODELLING PLAN

### 6.1 Dividing Project

Modeling Plan is one which divides the project into manageable sizes to share among the team members. The example shown below is for the Architectural Model.



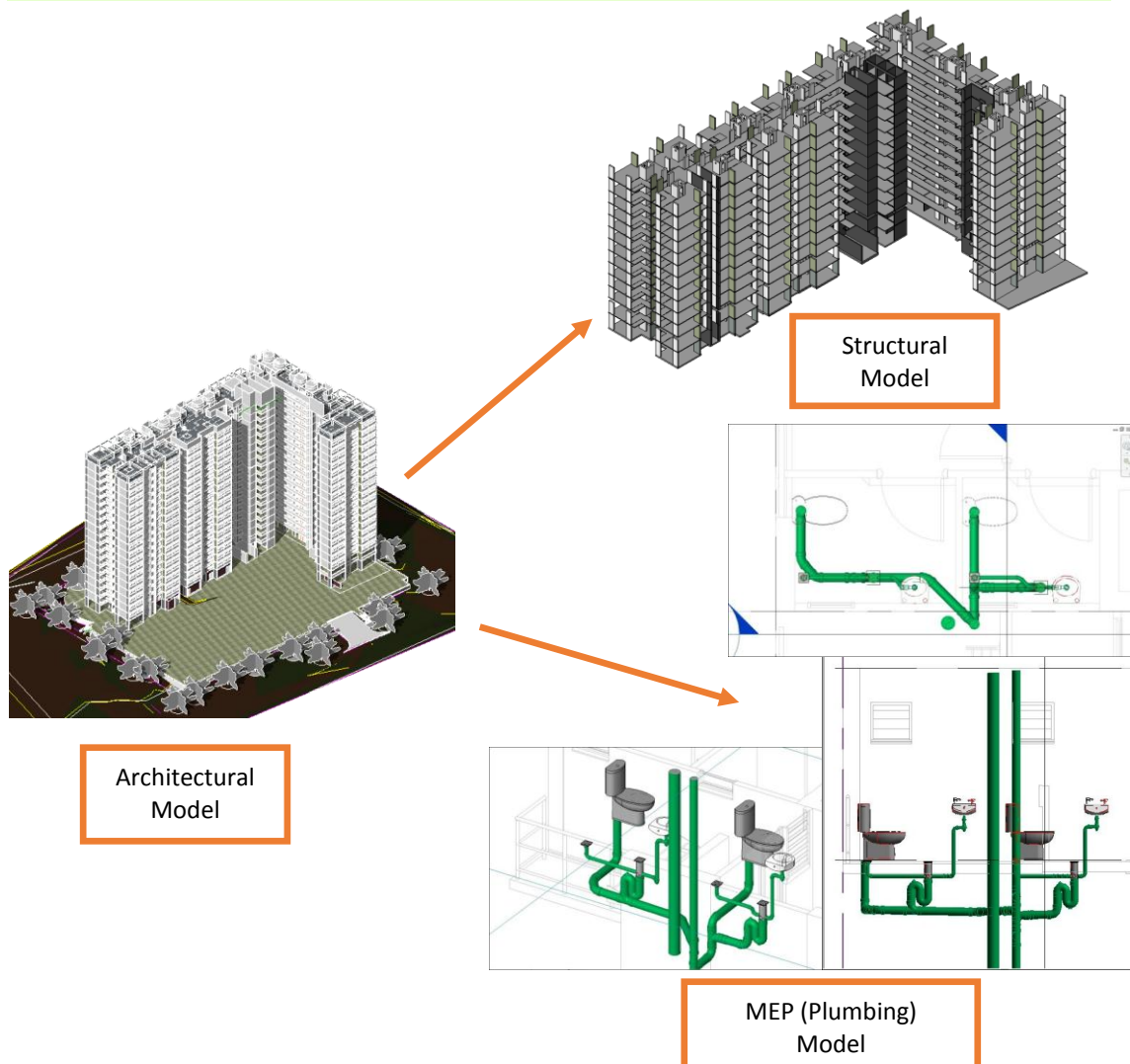
- **Revit Groups** are used mainly for repeating portions of the model. Groups help to propagate changes quickly. Groups can be used for typical units and vertical shafts that may have one or more instances in the model. They should be used minimally.
- **Revit Links** will improve the model performance. They are especially good for propagating changes when the project has typical floors. Links allow team members to share their work.
- **Worksharing** allows multiple modellers to work on a single model and share updates quickly. Worksharing can be used during the preparation of the documentation by all the team members in a single model.

## 6.2 Sharing of Files

It is recommended to share the Architectural Master and Link files with the Structural and MEP Engineers. The Structural and MEP Engineers can use the information in the Architectural model to prepare their models/documentation.

### Note:

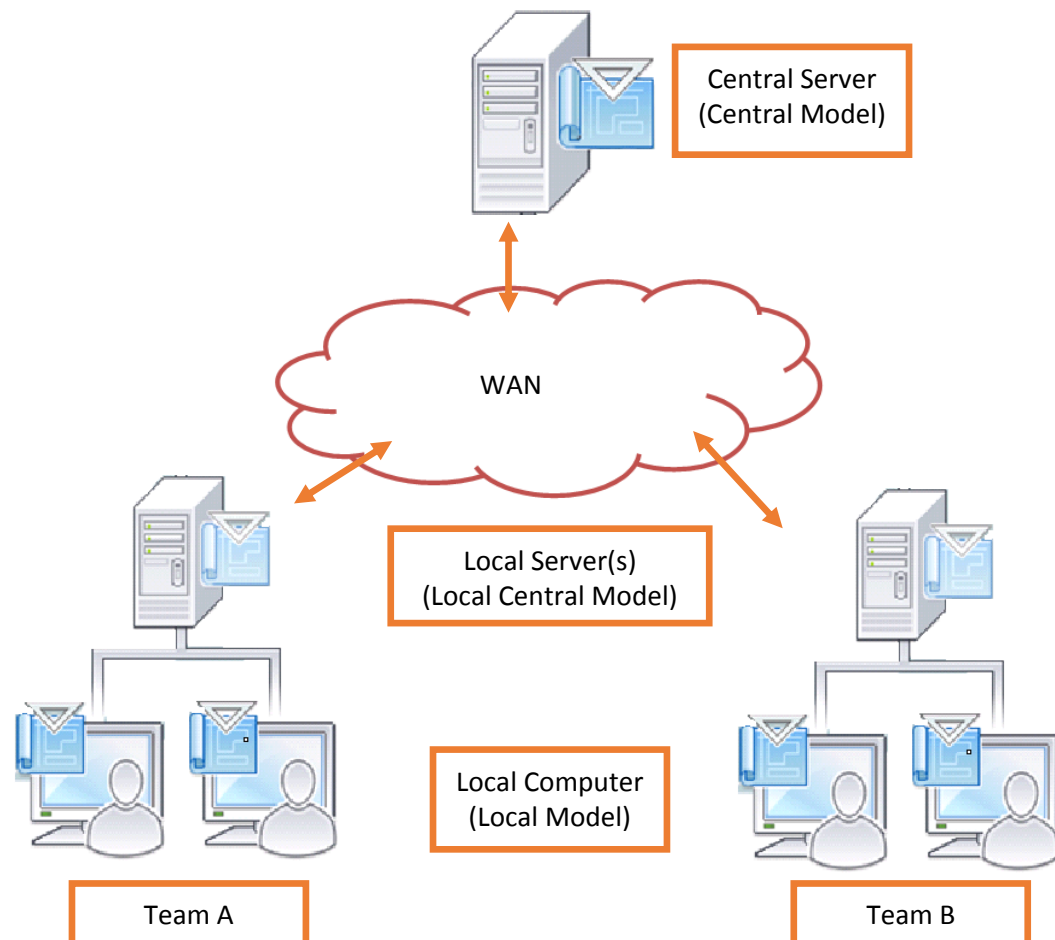
These steps will be explained in the later chapter of the document.



## 6.3 Revit Server

The next level of model sharing uses **Revit Server**. This is good for teams working remotely from different companies. **Revit Server** is a server application which is the foundation for server-based worksharing for Revit projects. The Revit Server uses a central server and multiple local servers for optimal project collaboration across a **wide area network (WAN)**.

- The Revit Server consists of a single central server that connects with multiple local servers.
- When a team member opens the server-based workshared project, he will be working in a **local copy** of the **central model**. This local copy, called the local model, is stored on the team member's computer. The central model is stored on the central server.
- As a team member works, the local server silently requests updated information from the central model on the central server, using available network capacity to transfer data over the WAN. The updated version of the model is stored on the local server, so the updates are readily available when a team member requests them.



When the teams are working remotely, it is recommended some kind of document management system is in place to share large files. This system should allow the team members to share files on the Internet. Most of these systems have good security features for controlling access to files.

## 7.0 ARCHITECTURAL MODELLING

### 7.1 Conceptual Design

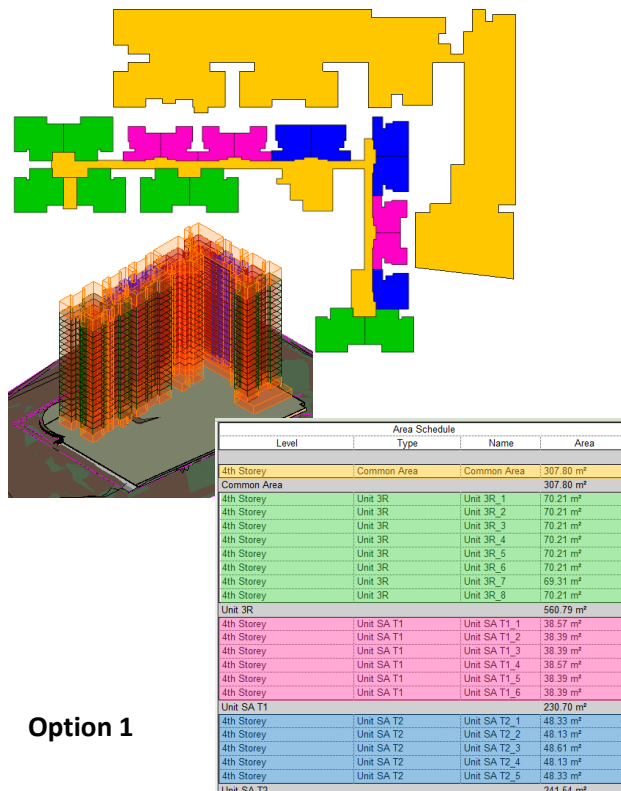
**Conceptual Design** is the first stage in the design process. The design team will prepare various design options based on HDB's design criteria and present them at the **Progress Reviews (PR)** and **Management Reviews (MR)**. The design team can choose either one of the option described for the **Conceptual Design**.

**Deliverable:** Design Concepts that consist of the schematic representation of blocks, storeys, units and their arrangements on site.

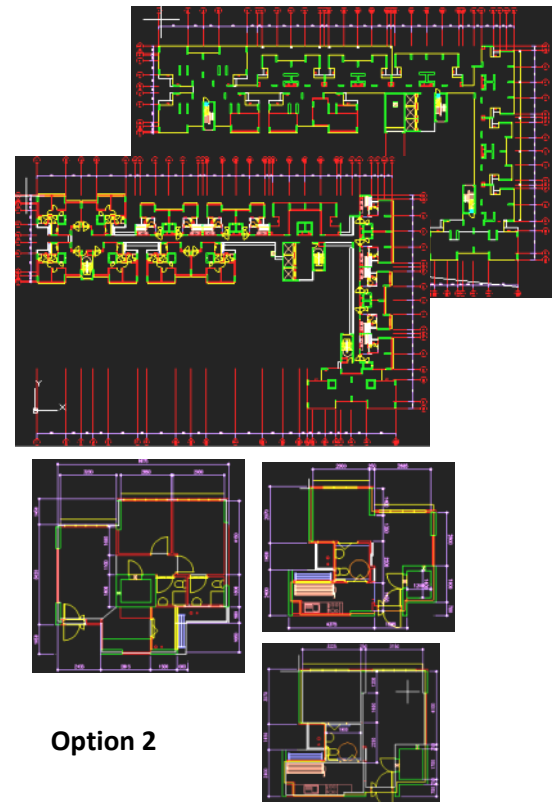
**Option 1:** Use Revit to prepare the design options. This option is suitable for a design team which is familiar with Revit's conceptual design tools. The conceptual model can be used for further design development, which will save time in the next stage.

Option 1 consists of **Site Planning BIM model(s)** for master plan site study and feasibility analysis. From this **massing model(s)**, space areas and volumes can be extracted to check against HDB's requirements and compare between design options. The number of massing models depends on the number of conceptual design options produced. Additional information may need to be added based on the design requirements.

**Option 2:** Use non-BIM tools to prepare the design options. E.g. AutoCAD, Sketch-up. This option is recommended only if there are tight deadlines given for this stage, multiple design options that need to be prepared, or if the project is being carried out by a design team that may have just started using BIM. This option gives them necessary time to learn Revit before the next stage.



Option 1

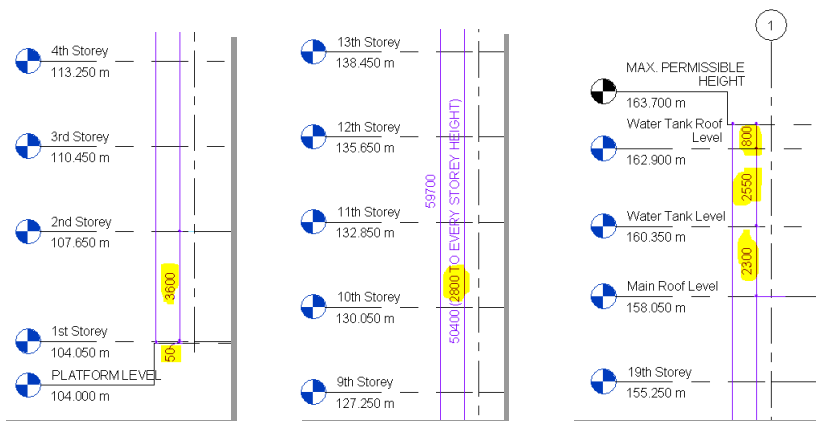


Option 2

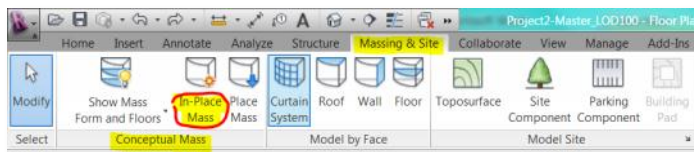
## Step 1: Create the Massing Model

The **massing model** can be created by following the steps below.

- Create a new project for the Massing Model and set up the coordinates, Project North, True North and Elevation Levels similar to the steps for creating an Archi Model under Section 5, Step 7 of this Guide.
- Open any one of the elevations and set the number of levels and floor to floor height as based on the design.
  - E.g. 1st Storey level is 50mm higher from the platform,
  - 1st Storey to 2nd Storey is 3600mm,
  - Typical Storey(s) height is 2800mm,
  - Main Roof Level to Water Tank Level is 2300mm,
  - Water Tank Level to Water Tank Roof Level is 2550mm and
  - Water Tank Roof Level to the Max Permissible Height is 800mm.

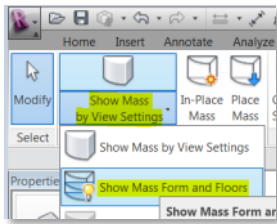


- It is recommended to prepare the massing model with the **In-Place Mass** tool individually for each unit and common area. This allows the floor area to be extracted for individual units, which can be checked against the requirement.

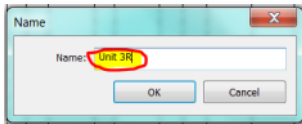


- Open the 2nd Storey Plan view as the residential units start from the 2nd Storey.
- Activate the visibility of the **Mass Form** and **Floors** from **Massing & Site** tab → **Conceptual Mass** panel → **Show Mass Form and Floors**.

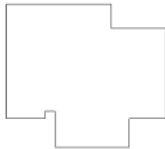
- f. Click In-Place Mass in **Massing & Site** tab → **Conceptual Mass** panel.



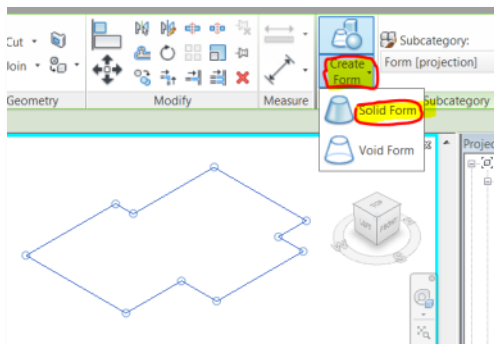
- g. Give a **Name** unique for the Unit type. e.g. Unit 3R.  
Revit enters sketch mode. Use the **Sketch Tools** available to create the Mass.



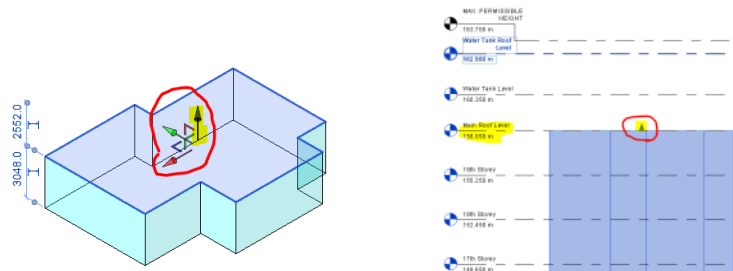
- h. Draw the foot print of the unit as per the design requirement.



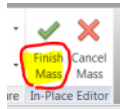
- i. Switch to the 3D view window, select the sketch lines just drawn and click **Solid Form** from **Modify | Lines** tab → **Form** panel → **Create Form**. This will create an extrusion from the selected lines.



- j. Select the top surface of the solid just created. The surface can be pulled up by holding the handle highlighted in the image on the left. It is recommended to do this step from the elevation view so that we can adjust exactly to the height we need.

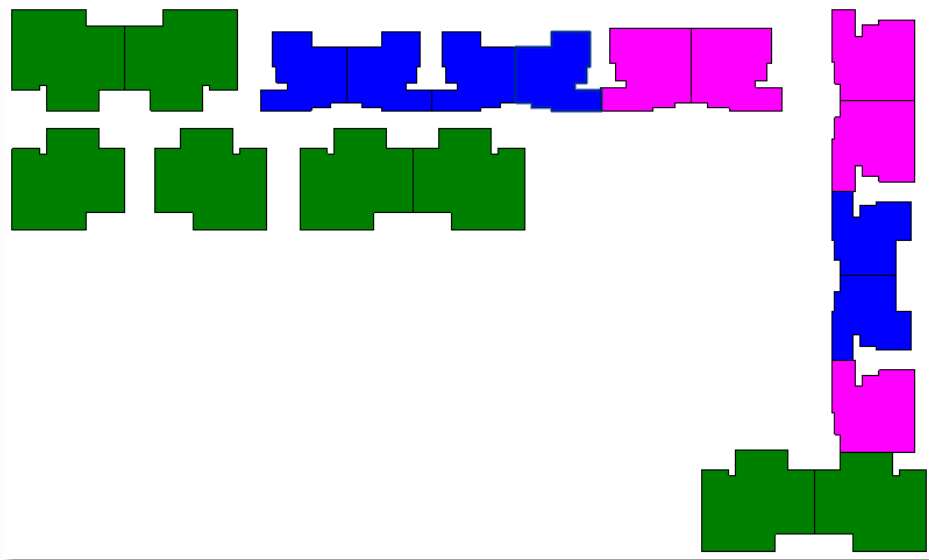


Click Finish Mass and switch to one of the elevations.

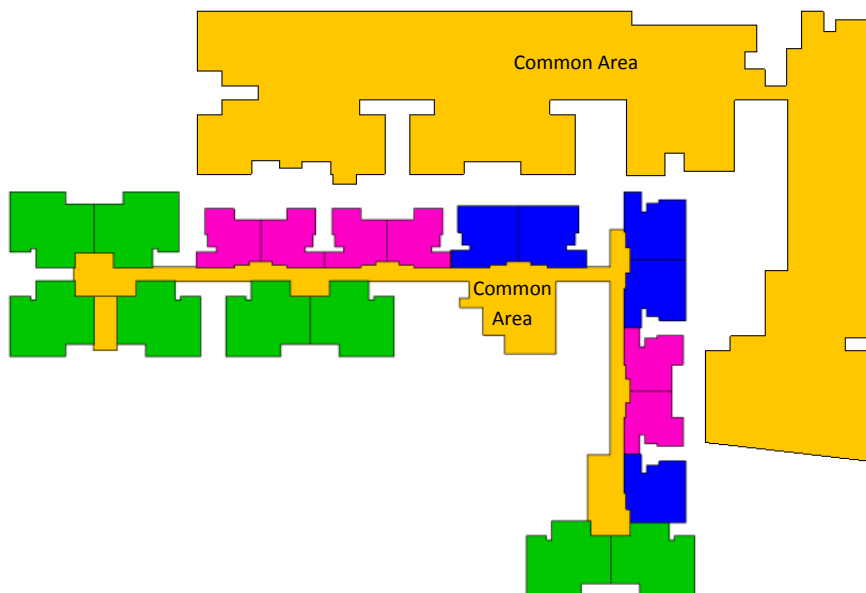


Extend the extrusion up to the Main Roof Level by holding the handle.

- k. Repeat the Steps (e) to (i) for the rest of the unit types.
- l. Arrange the units as per the design option.



- m. Similarly create In-Place Mass for the common area. The common area consists of all the rooms for services, ducts, stairs, lifts, refuse bin centre and access balcony that connects the units with the rest of the areas in the building. The footprint of the common area starts from the 1st Storey (including the area below the residential units). It will be different from the 2nd Storey and Typical Storey. There will be a minimum 3 solid forms in the mass created for the common area.





## Step 2: Create Mass Floors to Extract Floor Area/Mass

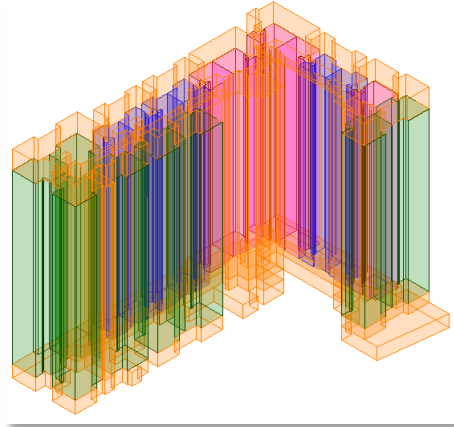
- a. Next create **Mass Floors** to extract floor area/mass.

Select the Mass objects one by one.

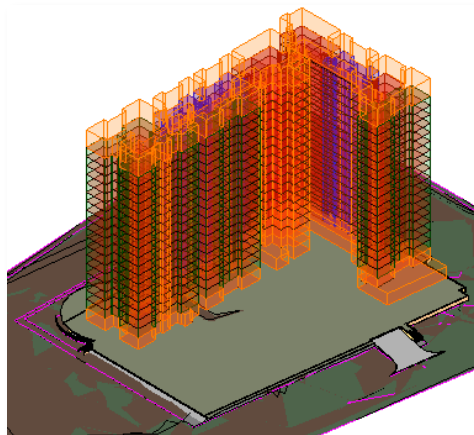
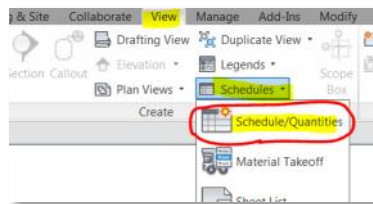
Click on **Modify | Mass tab** → **Mass Floors**.

- b. Select all the **Levels** shown in the dialog box.

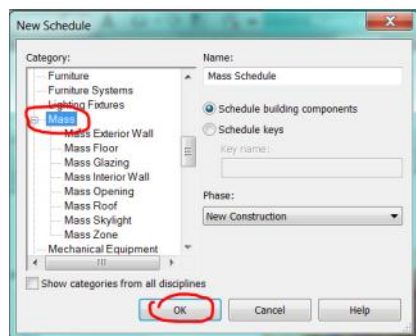
Click **OK** to complete the Mass floor.



- c. Create a schedule for the Mass Floor from the View tab

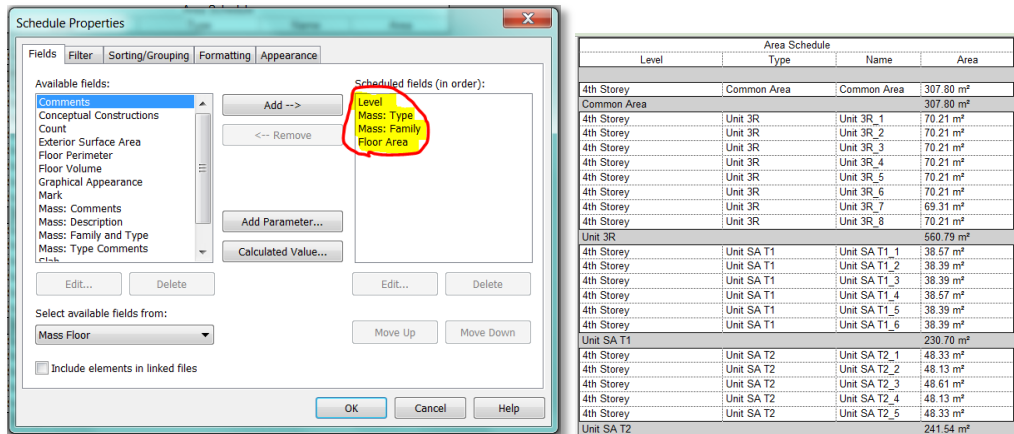


- d. Select **Mass** in the **New Schedule** dialog box that just appeared.





- e. Add the fields highlighted in the image on the right. Do the necessary settings in the Filter and Formatting tabs and click **OK** to see the schedule similar to the one shown below.



The key components for the conceptual design using BIM have been explained in the steps above. Prepare the rest of the contents as per the design requirements. Grids, Annotations and Sheets can be used to complete the task.

Once a design option is selected, archive the contents and move on to the **Preliminary Design** stage. Use the contents of the selected design option as a base for the preliminary stage.

## 7.2 Preliminary Design

Preliminary design is the second stage in the process. In this stage the selected conceptual design option will be further developed into a proper BIM model using BIM elements like Wall, Column, Slab, Door, Window and other objects. Refer to **HDB's BEP Template** for list of BIM elements that need to be modelled. Implement the modelling plan discussed earlier in this document.

- Create link files for floors. e.g. Site, 1st Storey, 2nd Storey, Typical Storey and Roof.
- Create typical units as groups inside the link files.
- Create a Master File and set-up the necessary views for each block.
- Create an overall Master File that links all the blocks together into the site.

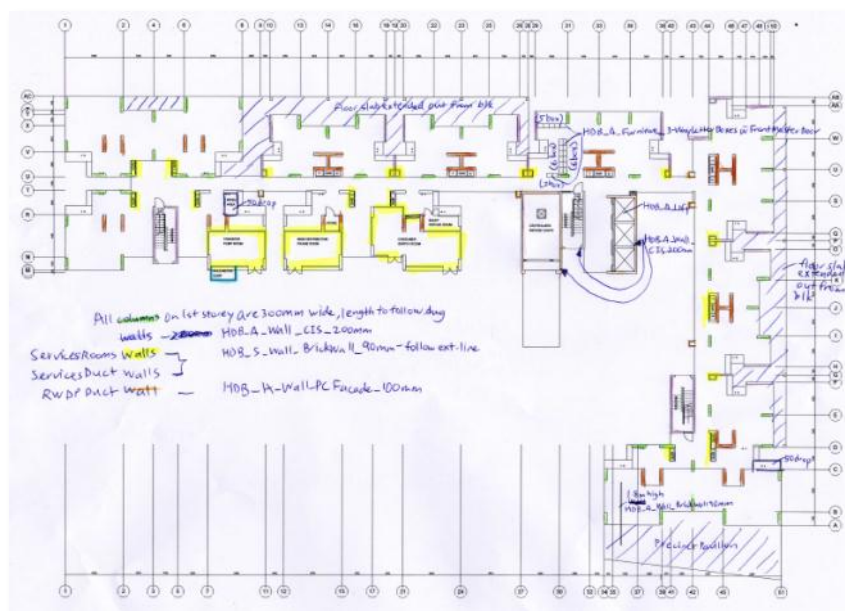
Refer to **Appendix 4** for the steps on how to convert CAD drawings to BIM model when Option 2 (using non-BIM tools) is selected in Conceptual Design.

### **Deliverables:**

- Architectural BIM model for design coordination with Structural and M&E Engineers
- Architectural BIM model for URA Submission  
Please refer to Architectural BIM e-Submission guides for Specific Requirements of the Agencies.

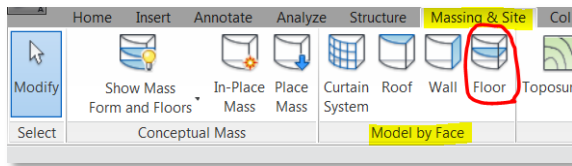
This chapter explains the steps on how to develop the Preliminary Design Model(s) from the **Mass Model** created in Conceptual Design (Option 1).

- a. The **Site Model** created in the Conceptual Design can be used as it is.
- b. The 1st Storey Model can be created by first duplicating the Mass Model project file.
- c. Choose the families and types to be used for the Floor, Column, Wall, Door, Window, CRC, Stairs and Lifts. If the families are not available then they will have to be created. Elements can be placed with approximate sizes and at approximate locations as there may not be enough information at this stage.



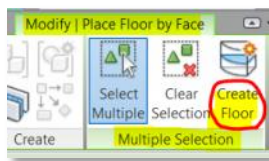
## Step 1: Convert Mass Floors to Floors

- Convert the Mass floor of 1st Storey to Slab. Go to **Massing & Site** → **Model by Face** and click **Floor**.

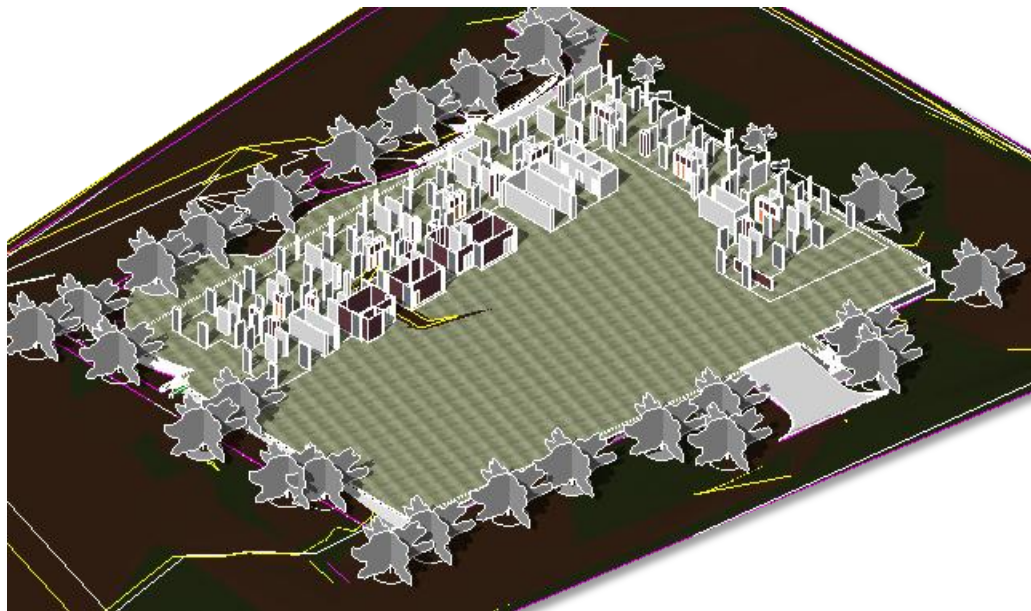


Select the **Floor type** from the type selector.

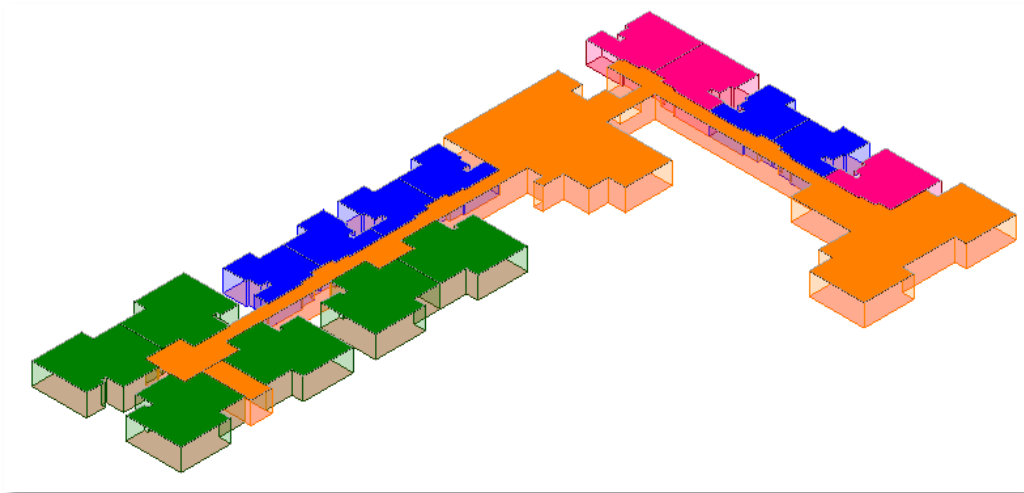
- Pick the mass floor of the 1st Storey and click create floor in **Modify | Place Floor by Face** tab. This will create the Slab for the entire floor. Create openings and fill with separate slabs for areas with level difference. Ex. **Bath**.



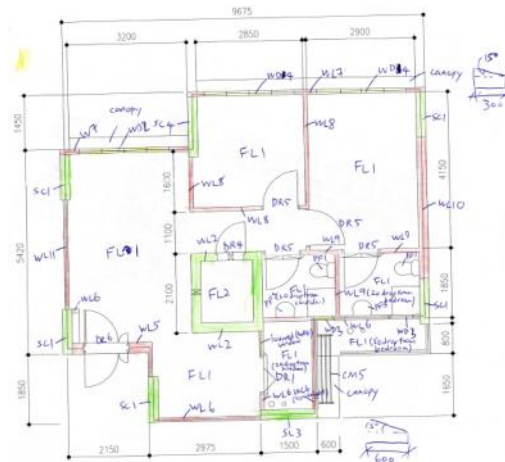
- Model the Columns, Walls, Doors and Windows. Add rooms like Pump Room, MDF Room, Bulky Refuse Room, Consumer Switch Room, Store, Refuse Bin Centre, Lift/Lift Lobby and Stairs. **Home** Tab → **Room & Area** Panel → **Room**
- Duplicate the Project Base File to create a **Master File**. Link the **Site Model** and the **1st Storey Model**.



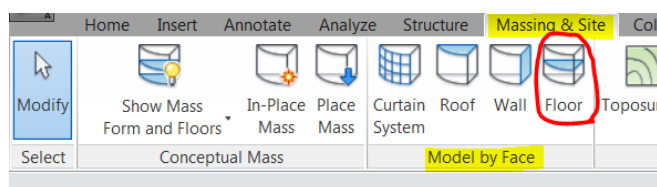
- e. The **2nd Storey Model** can be created by duplicating the Mass Model project file. Edit the Mass Model, reduce the extrusion height of the 3rd Storey as shown below. Preserve Level 2 and Level 3 and remove the rest of the levels. This is to avoid confusion when the model is linked to the Master File.



- f. Choose the families and types for the Slab, Column, Wall, Door, Window, CRC, Stairs and Lifts. If these families are not available, they will have to be created. Elements can be placed with approximate sizes and at approximate locations as there may not be enough information at this stage.



- g. Convert the Mass floor of typical unit mass to Slab. Go to **Massing & Site** → **Model by Face** and click **Floor**.



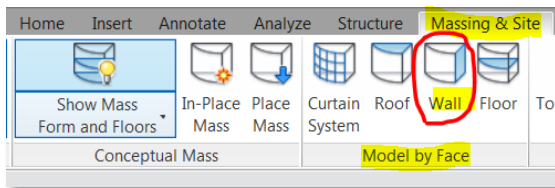
Select the **Floor type** from the type selector.

- h. Pick the mass floor of the typical unit and click create floor in **Modify | Place Floor by Face** tab. This will create the Slab for the entire unit.

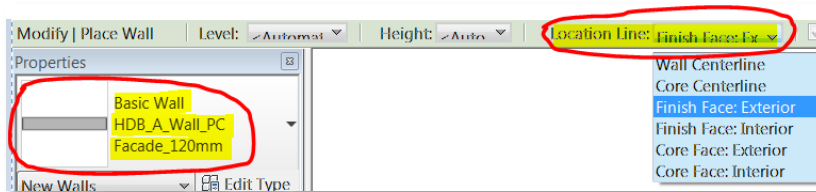


## Step 2: Convert Mass Walls to Walls

- a. Convert the external face(s) of the typical unit mass to Wall(s). Go to **Massing & Site** → **Model by Face** and click **Wall**.



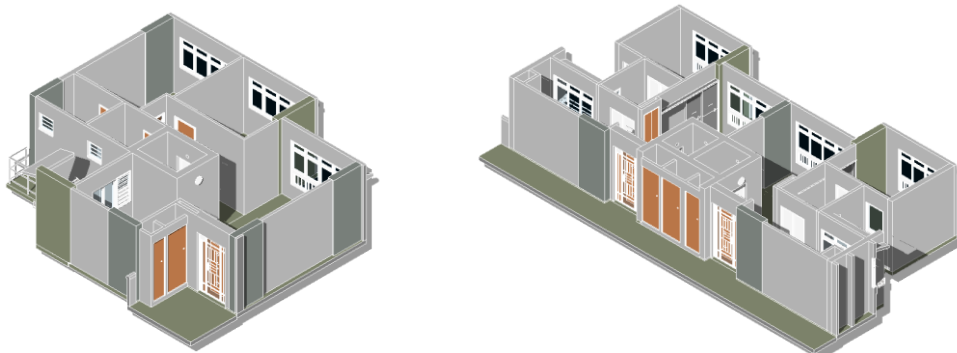
- b. Select the **Wall type** from the type selector and **Location Line** from the Option panel.



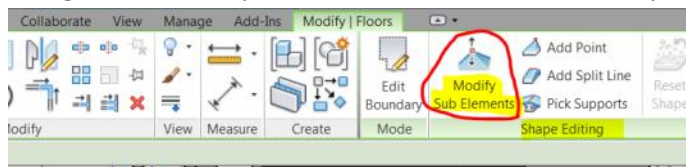
- c. Pick the desired vertical face of the typical unit mass. This will create the wall attached to that face. These walls will form the External facade and common walls of the unit.

## Step 3: Create the Unit Layout

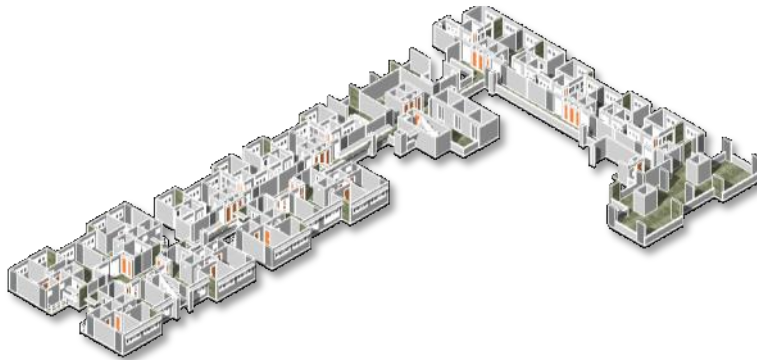
- a. Model columns and walls to create the unit layout. Place doors, windows and other objects necessary at this stage. Create different slabs for areas with differences in levels (e.g. Bath/WC) or thickness (e.g. Household Shelters).
- b. Select the unit and make it as a group. Repeat this for the rest of the typical units. These units can be un-grouped when the unit design is confirmed to reduce the file size.



- c. Place the Units (Groups) in the plan, add the rest of the Slabs, Columns, and Walls in the common area and complete the 2nd Storey Model. Link to the Master File created in **Step 1(a)**.
- d. Create Ramps at required areas (e.g. Entrance to the Units, Entrance to the Bath/WC etc) This can be done by editing the slab. Select the Slab, Go to **Modify | Floors** tab → **Shape Editing** Panel and Click on **Modify Sub Elements**. Click on the node that needs to be changed in the slab profile and set the elevation as required.



- e. Doors of the service ducts should be 100mm above the finished floor level of the Access Balcony. Set the Sill Height parameter of the doors to 50mm as the floor level of the Access Balcony is already -50mm.



#### Step 4: Create the Typical Storey Model & Roof Model

- b. Duplicate the 2nd Storey Model file to create the **Typical Storey Model**. Move the contents of the duplicated model to the 3rd Storey (**BCA- \_FP\_3rd Storey Plan View**). Make the necessary changes to the layout and Link to the Master File created in **step 3.d**. Copy the link to the rest of the Typical Floors, by **Copy to Clipboard** and **Paste Aligned to Selected Levels**, until the level below the top most Residential Level.
- c. Duplicate the Typical Storey Model and create the **Roof Model** that contains the top most **Residential Level**, **Main Roof Level** and **Water Tank Level**. Some key items to be modelled:
- Water Tanks,
  - Access Platforms,
  - Lift Motor Rooms,
  - Slab thickening for House Hold Shelter and
  - Vents for the service duct coming from the units.
- d. Complete the Roof Model and link to the Master File created in **Step 1(a)**.



- e. Add the basic dimensions in the Master File, clean up the Plans and Elevations. As part of the documentation, prepare the 1:100 scale Plan, Elevations and Sections. The model is ready for the next stage.

**Note:**

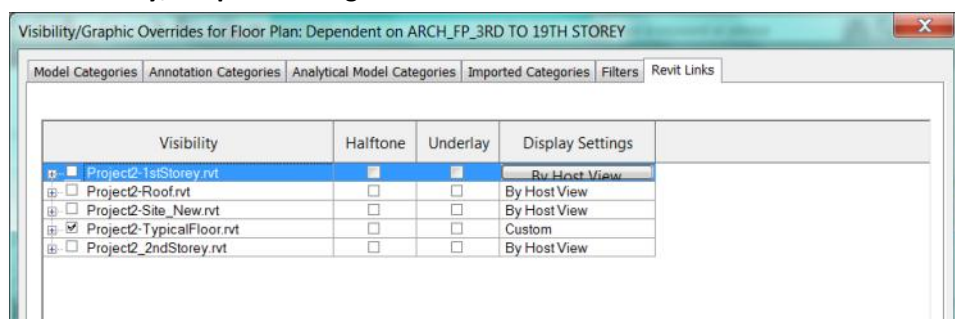
The model at this stage should be sufficient for URA submission. Please refer to Architectural BIM e-Submission Guideline for detail requirements.



**Note:**

A clean-up is required for the links. In the clean-up, user need to hide the Grids and Levels that comes from the link files and reveal the visibility of correct floors in the levels. E.g. Display only the 1st Storey model and hide the rest of the links in the 1st Storey plan view.

- f. All these can be done in the **Visibility/Graphics** → **Revit Link** Panel. Type **VG** to activate the **Visibility/Graphics** dialog box.



- g. Share the Preliminary Design model with the Engineers to prepare their part of the model.

## 7.3 Detailed Design

Detailed Design is the third stage in the process. In this stage the Preliminary Design model will be further developed with more accurate BIM elements based on the feedback from the other disciplines and Technical Departments. Additional BIM elements need to be added to complete the model as well. Refer to **HDB's BEP Template** for list of BIM elements that need to be modelled.

Examples of the additional elements were given below and highlighted on the model (right)

- Railing for Aircon ledge,
- Clothes Drying Racks
- Canopies with the connecting Beam,
- Railing on the parapet walls and
- Handrail along the Access Balcony



### ***Deliverables:***

- Architectural BIM model for Tender with drawings highlighted in the next section
- Architectural BIM model for Regulatory Approvals  
Please refer to Architectural BIM e-Submission guides for Specific Requirements of the Agencies.



**2D information** can be used to complement the BIM model to improve the detail of the model. e.g. Hatch patterns can be used to represent the Tile Finishes either in the 2D views or as part of the material.

**The following are usually additional documentation to be done in this stage:**

- 1:50 scale Layout Plans and Sections of key areas like the Typical Unit, Lift Lobby and Central Refuse Chute.
- 1:50 scale Finishes Plans and Sections for the Typical Unit, Lift Lobby, Central Refuse Chute, Bath and Kitchen.
- 1:50 scale Ceiling Plan for the Lift Lobby if required by the design specification.

Note:

It is not necessary to produce the entire set of documentation from the BIM model. 2D detail drawings (e.g. extrusion of window frame) could be used to supplement the drawings from the BIM model.

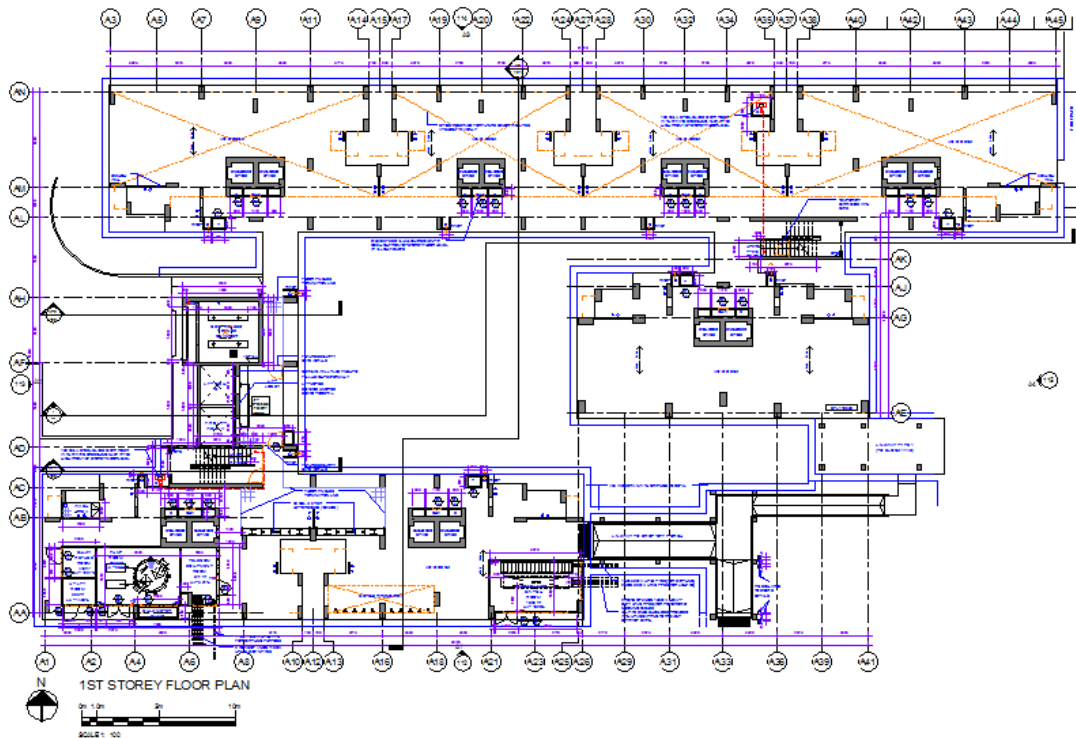
The following are some of the drawings to be produced from the model in the **Detailed Design** stage:

<b>DRAWINGS</b>	<b>SCALE</b>
1. LAYOUT & KEY PLAN	1:500
2. 1ST STOREY FLOOR PLAN	1:100
3. 2ND STOREY FLOOR PLAN	1:100
4. TYPICAL FLOOR PLAN	1:100
5. MAIN ROOF PLAN	1:100
6. FLOOR PLAN OF WATER TANK & PUMP ROOM	1:100
7. ROOF PLAN OF LIFT WELL & STAIRCASE	1:100
8. ELEVATIONS	1:100
9. SECTIONS	1:100
10. TYPICAL UNIT PLANS	1:50
11. PLANS OF LIFT LOBBY & STAIRCASE	1:50
12. TYPICAL UNIT FINISHES LAYOUT	1:50
13. FINISHES LAYOUT OF LIFT LOBBY, CENTRALISED REFUSE CHAMBER & WASH AREA	1:50
14. ELEVATIONS OF KITCHEN & BATH/WC	1:50
15. ELEVATIONS OF LIFT LOBBY, CENTRALISED REFUSE CHAMBER AND REFUSE CHUTE AT WASH AREA	1:50
16. REFLECTED CEILING PLANS OF LIFT LOBBY	1:50
17. TYPICAL PLANS OF HOUSEHOLD SHELTER	1:50
18. SECTIONS OF HOUSEHOLD SHELTER & STOREY SHELTER	1:50

**Additional drawings may need to be produced, depending on the requirements of the project.**

## Step 1: Create a Floor Plan

a. A sample of a 1st Storey Floor Plan is shown below.

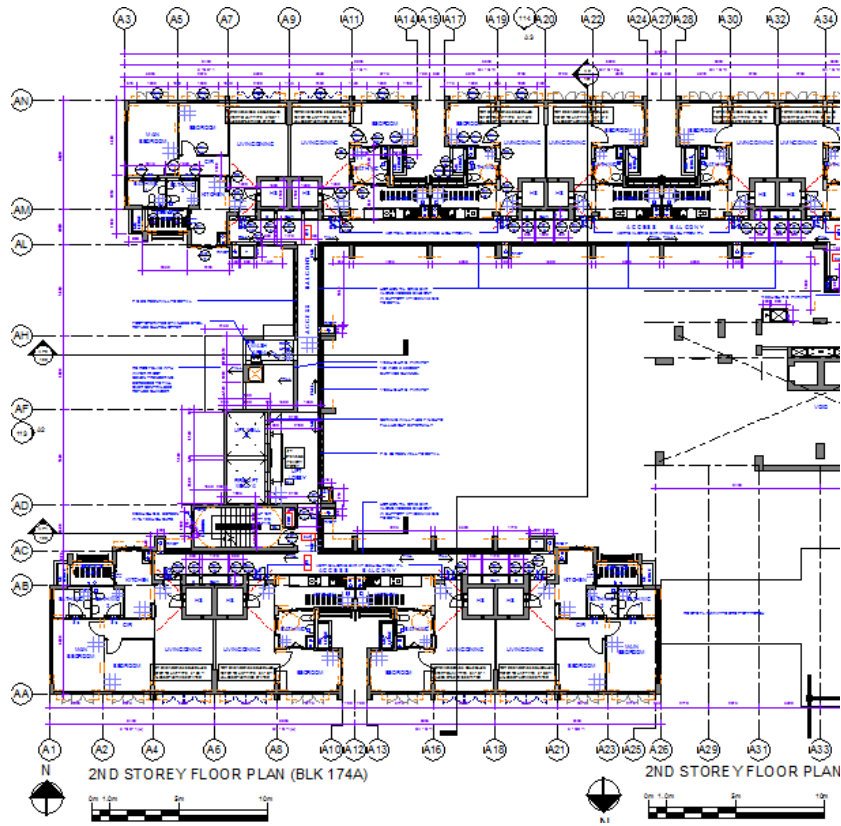


Add the following annotations to the plan view:

- Grid dimensions;
- Setting out for the Room(s);
- Indication of Room Name(s);
- Indication of Finishes and Fall;
- Annotations of Typical Elements;
- Door and Window tags;
- Section line marking;
- Elevation markings; and
- Indication of surface drains

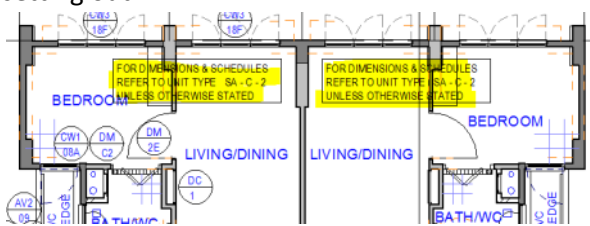
## Step 2: Create a Typical Floor Plan

a. A Sample of a 2nd Storey Plan is shown below. Typical Floor Plan(s) will look similar to this.



Add the following annotations to the plan view:

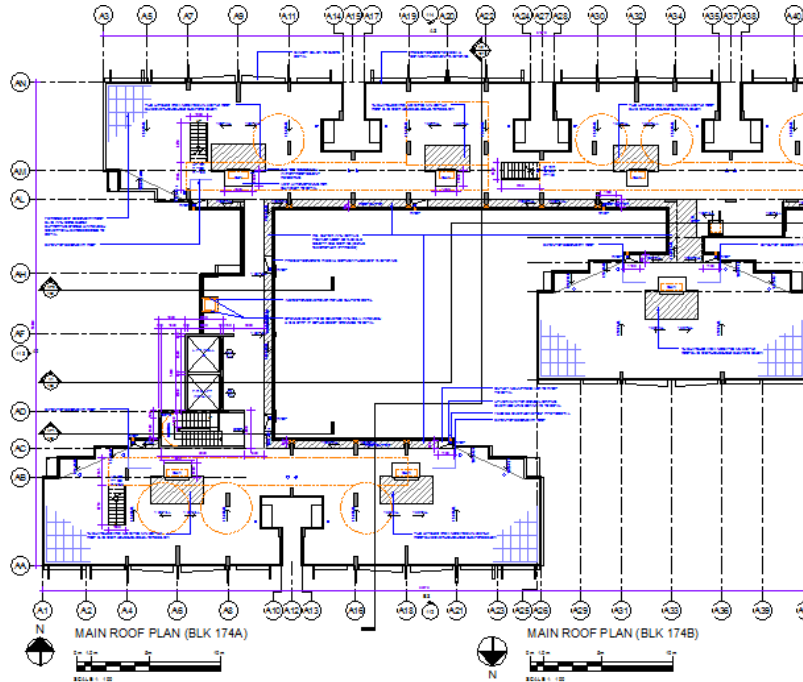
- Grid dimensions
- Setting out for Typical Unit(s). It is not necessary to repeat the setting out for similar/mirrored units. Indications should be made, referring to the unit that has the setting out.



- Setting out for the Common Area
- Indication of Room Name(s);
- Indication of finishes and Fall;
- Annotations of Typical Elements;
- Door and Window tags;
- Section line marking; and
- Elevation markings

### Step 3: Create a Roof Plan

- a. A sample of a Roof Plan is shown below. (Annotations are similar to the Floor Plans mentioned earlier.)



### Step 4: Annotate the Elevation

- a. A sample of an Elevation is shown below.

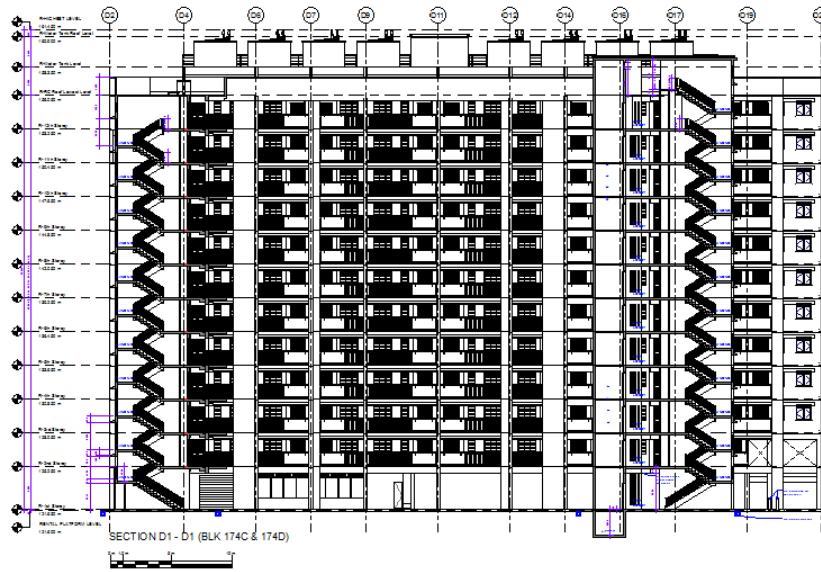


Add the following annotations to the elevation view:

- Grid dimensions;
- Floor to Floor height;
- Indication of levels; and
- Annotations of Typical Elements

## Step 5: Annotate the Section

a. A sample of a Section is shown below.

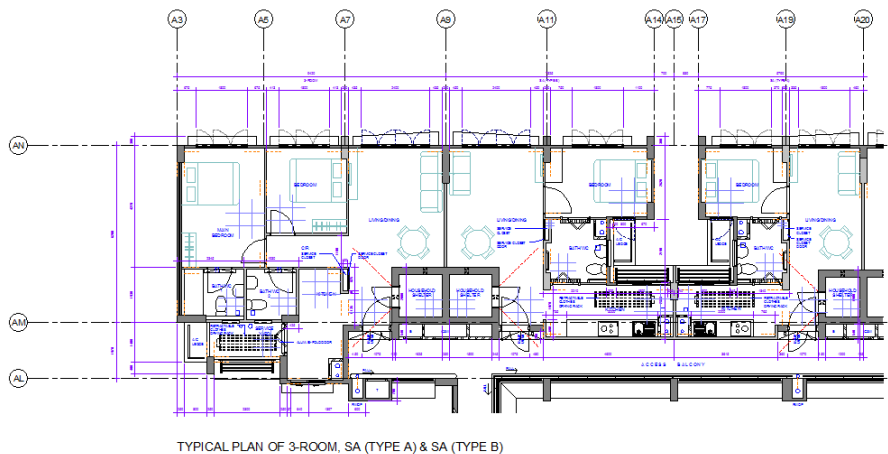


Add the following annotations to the section view:

- Grid dimensions;
- Floor to Floor height;
- Indication of levels;
- Height indication of Typical Areas; and
- Annotations of Typical Elements

## Step 6: Create a Typical Unit Plan

a. A sample of 1:50 a Typical Unit Plan is shown below.

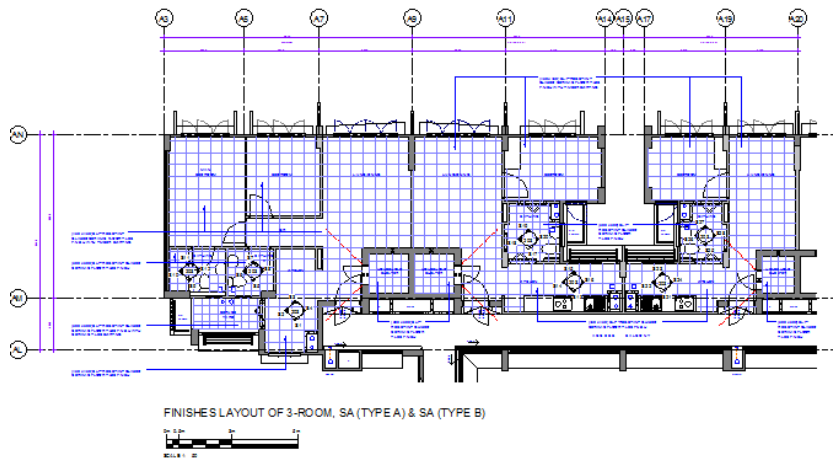


Add the following annotations:

- Grid dimensions;
- Setting out of Room(s);
- Indication of Room Name;
- Indication of finishes;
- Annotations of Typical Elements; and
- Indication of Furniture/Fittings

## Step 7: Create a Typical Unit Finishes Layout

a. A sample of 1:50 a Typical Unit Finishes Layout is shown below.

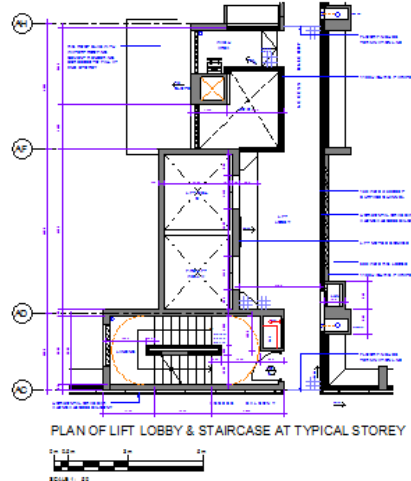
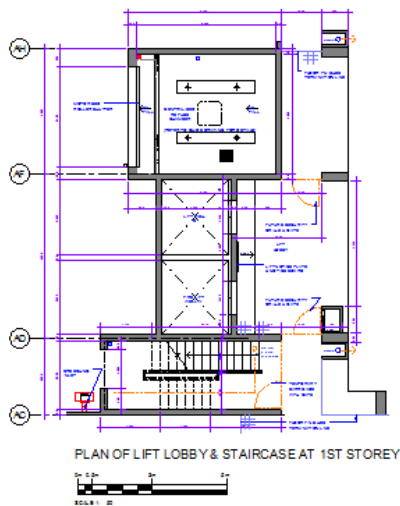


Add the following annotations:

- Indication of the tiles using Fill pattern. Room(s) 300 X 300 and Bath/WC 200 X 200;
- Annotate the finishes

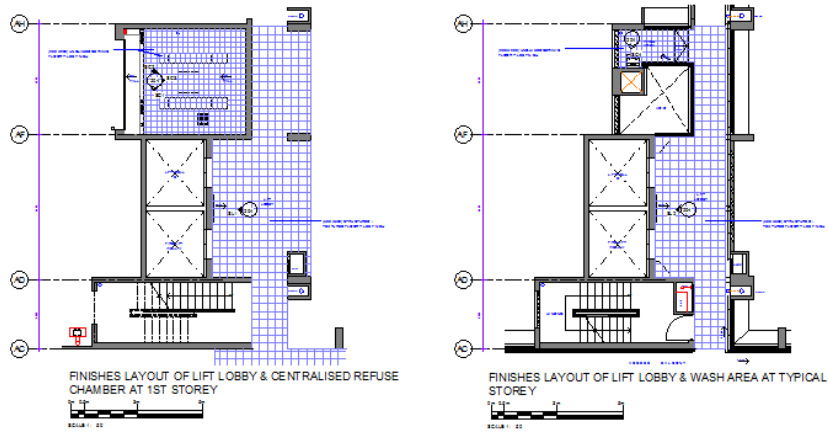
## Step 8: Create 1:50 Drawings of Lift Lobby and Refuse Chute Areas

a. Samples of 1:50 drawings (1st Storey and 2nd Storey) of Lift Lobby and Refuse Chute areas are shown below.



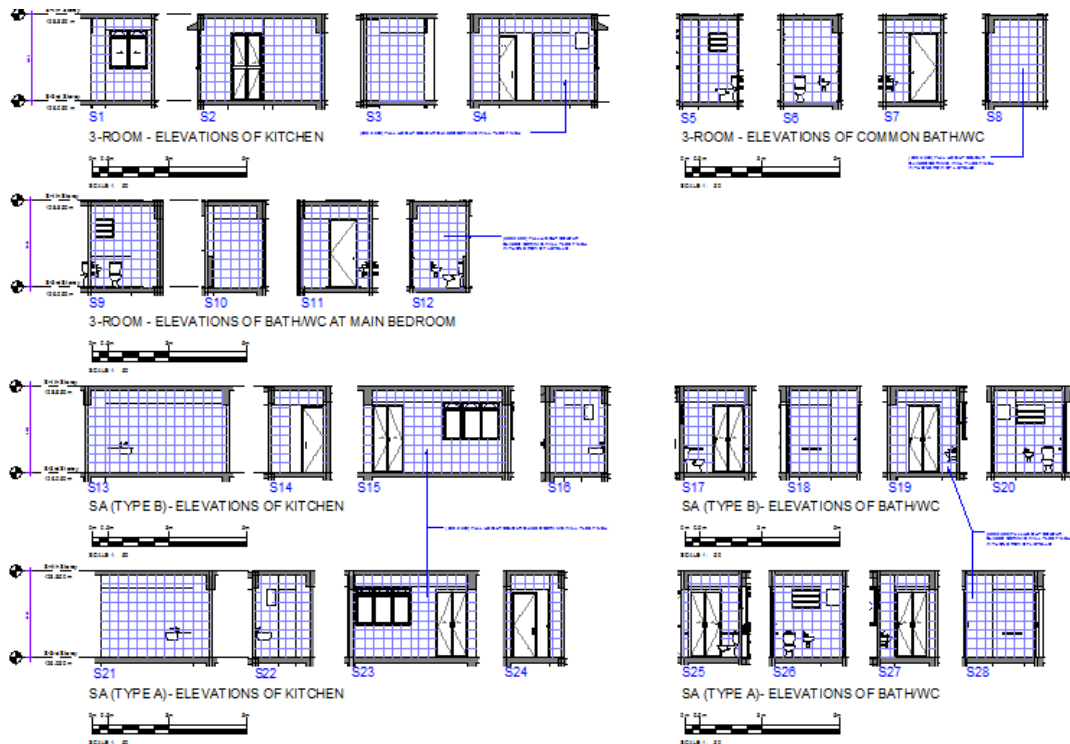
## Step 9: Create 1:50 Finishes Drawings of Lift Lobby and Refuse Chute Areas

- a. Samples of 1:50 Finishes drawings (1st Storey and 2nd Storey) of Lift Lobby and Refuse Chute areas are shown below.



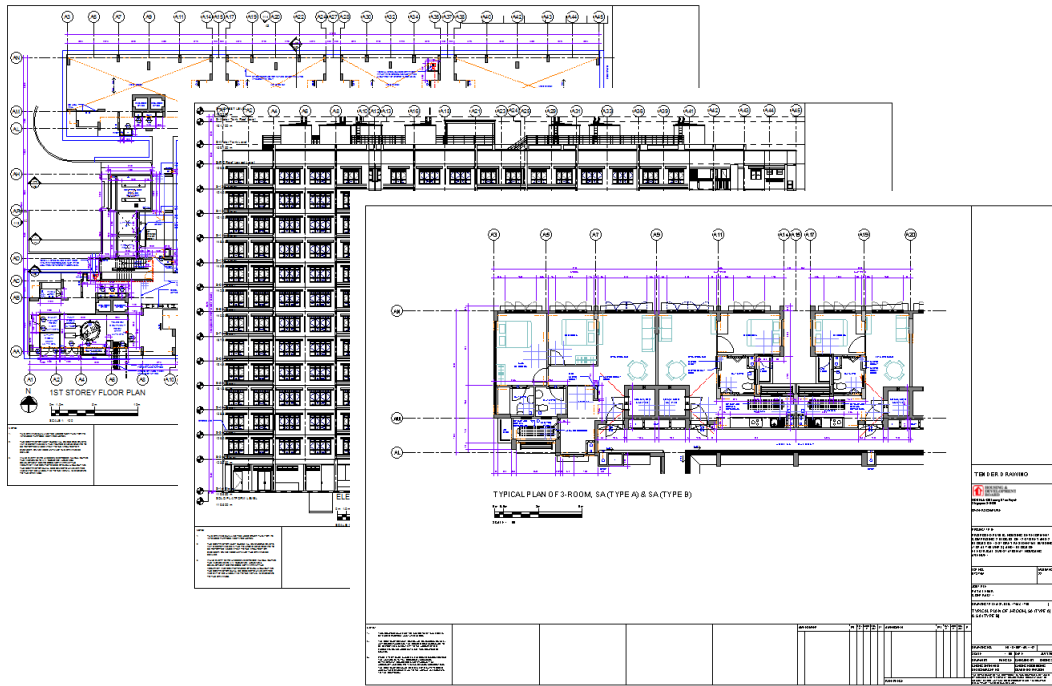
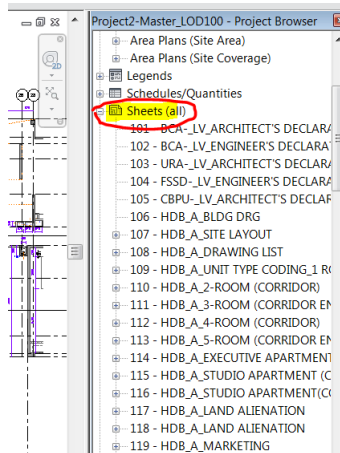
## Step 10: Create 1:50 Elevations of Kitchen and Bath/WC

- a. Samples of 1:50 Elevations of Kitchen and Bath/WC are shown below.



## Step 11: Create Sheets and Publish for Submission

- a. Once the views are ready, create the Sheets, drag the views into the sheets and complete the documentation process.



- b. **Publishing Model and Drawings to Non-editable File Format**

Refer to Appendix C of Architectural BIM e-Submission Guideline for step-by-step guide to export/ publish to DWF/PDF for regulatory submission.

### Note:

The drawings produced from the BIM model during the Detailed Design stage can form part of the tender documents together with other 2D detail drawings.



## 8.0 STRUCTURAL MODELLING

### 8.1 Preliminary Design

The preliminary Structural BIM Model could be created from the Architectural BIM Model. The Grids, Levels, Slabs, Columns and Structural Walls could be copied from the Architectural Model to create the base Structural Model, while the Beams (Structural Framing) need to be added to complete the Structural BIM Model. Refer to **HDB's BEP Template** for list of BIM elements that need to be modelled.

#### Note:

It is not necessary for the elements to be modelled as Precast Elements.

#### Deliverables:

- Structural BIM model for design coordination with the Architect and M&E Engineer.

The Structural BIM model can be created in the following ways, depending on the Design/Analysis tool to be used:

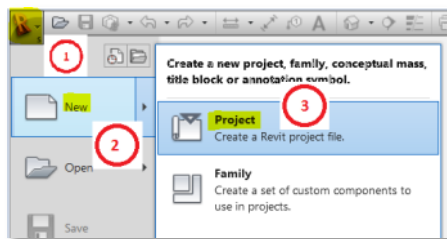
- a. Using the Structural BIM authoring tool, before being transferred to the Design/Analysis tool to perform Design/Analysis;
- b. Using the Design/Analysis tool, before being transferred back to the Structural BIM authoring tool.

#### Note:

Some of the design analysis tools support the transfer of data bi-directionally.

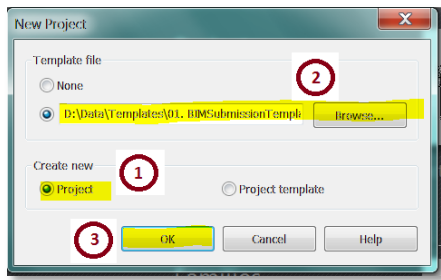
#### Step 1: Create a New Project

- a. Create a new project from the Project Template. From the **Application Menu** choose **New → Project**.



- b. In the **New Project** dialog box choose **Project** in the Create new section.

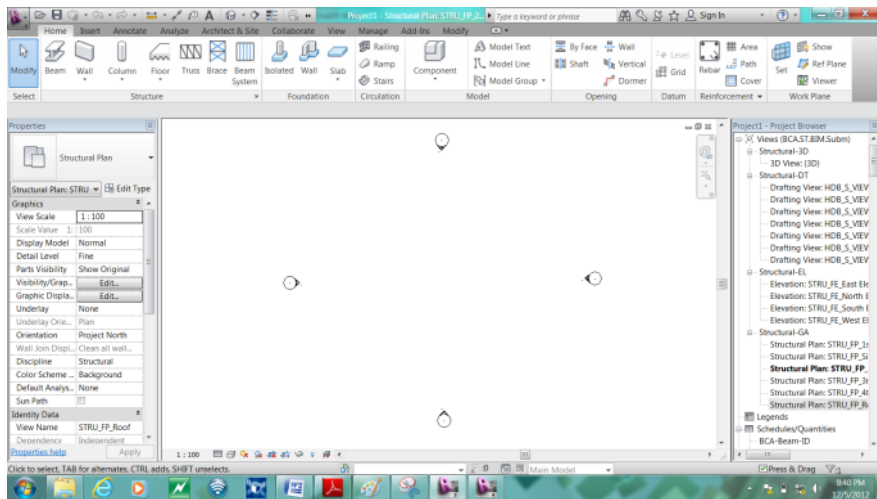
- c. Click the **Browse...** button and locate the template file using the file dialog box.



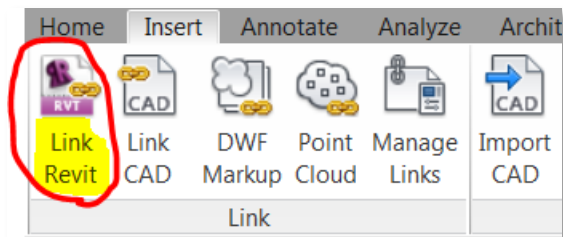
- d. Click **OK** to create the new project.

## Step 2: Link the Architectural Model

- a. The new project created in **Step 1** is shown in the image below. Link the Architectural BIM Model and copy the settings and content necessary for the Structural BIM Model.



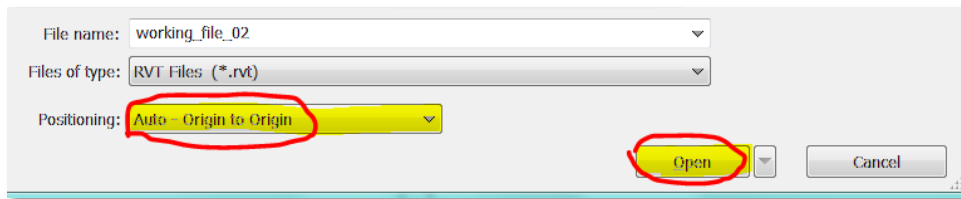
- b. From the **Insert** Tab choose **Link Revit**.



### Note:

It is good to link the individual storeys one by one rather than the entire block (Master File). This will be helpful later when using the Copy/Monitor tool to copy the Architectural elements.

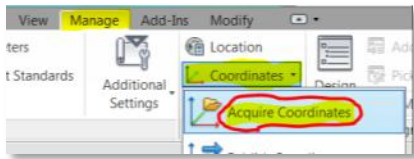
- c. Select the Architectural BIM Model using the file dialog box. Choose **Origin to Origin** for the **Positioning** and click **Open**.



- d. After the Architectural model is linked, the content may not be visible. It is necessary to **copy settings like Shared Co-ordinates, Levels, Grids and Visibility**.

### Step 3: Copy Shared Coordinates, Levels, Grids and Visibility

- a. Copy the shared co-ordinate settings from the Architectural Model. Switch to one of the **Elevation** and **Zoom extent**. The levels of the Structural BIM Model and Architectural BIM Model may not be in the same place.
- b. Refer to Section 5.4 of this Guide on how to Acquire Coordinates from the Project Base Model and change the Elevation Levels.



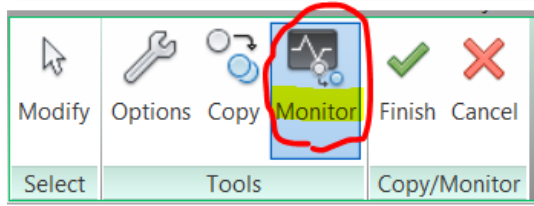
- c. Create or delete levels depending on the project requirements.  
Create Additional Level for Pile Layout Plan view.  
Rename the newly created levels.

Check whether there are plan views for 1st Storey, 2nd Storey, Typical Storey, Main Roof Level, Water Tank Level and Water Tank Roof Level. If it is not there then **Create** plan views (the menu is in **View** tab) for the missing levels and rename them as per the standard.

- d. Link/associate the levels to the Architectural BIM model to make sure that changes to the levels in the Architectural BIM model's level are reflected. This can be done using the tool **Copy/Monitor** in the **Collaborate** tab.

**Note:**  
This needs to be done in an elevation view.

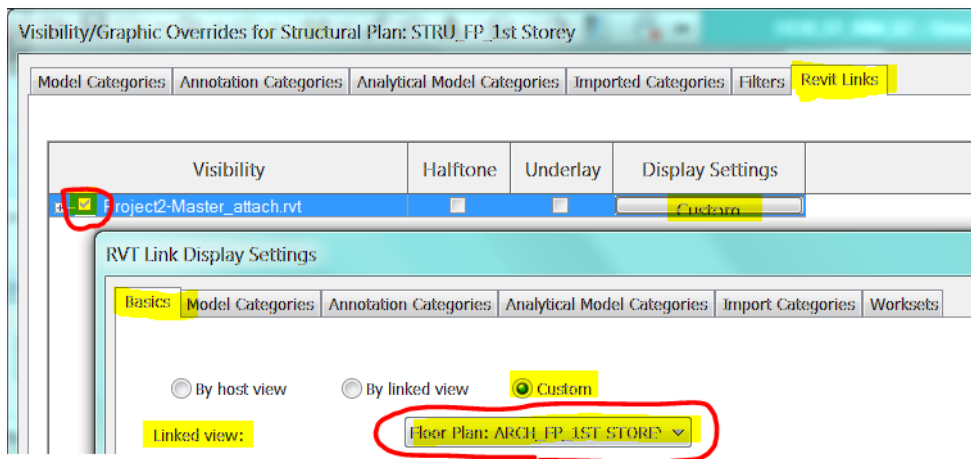
Go to **Copy/Monitor** tool and choose **Select Link**. Pick the Architectural model just linked in the previous steps. This will open up a specific tab for **Copy/Monitor**.



Choose the **Monitor** tool, pick the 1st Storey level and pick the 1st Storey level of the Architectural BIM model. This will link the levels together and a Monitor icon will appear. Repeat this for the rest of the levels and click **Finish**. From now on any changes in the Architectural levels will be highlighted.



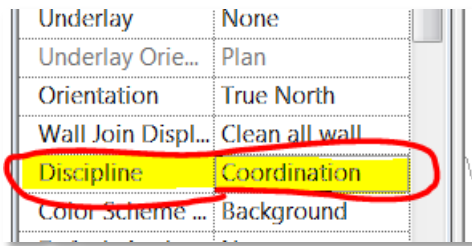
- e. Copy and monitor the grids from the Architectural Model.
- f. Switch to the 1st Storey plan view.
- g. To show the corresponding Architectural plan, Right click on the view in the **Project Browser**. Duplicate the view and Type **VG** to activate the Visibility/Graphics dialog box.



Choose the **Revit Links** tab, make sure the Architectural Model link is selected in the **Visibility**. Click on the **Custom** button under **Display Settings**. This will activate the **RVT Link Display Settings** dialog box.

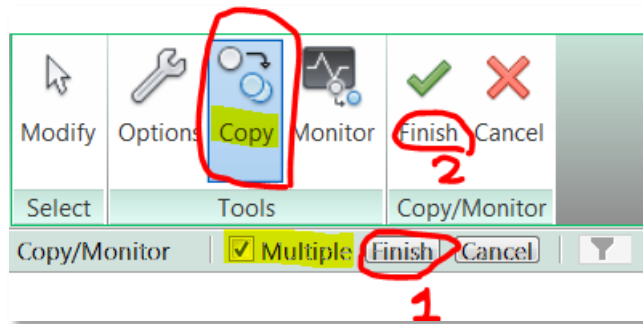
Choose **Custom** radio button in the **Basics** tab. Choose the corresponding view in the **Linked view** and click **Apply** twice. This will display the correct plan.

To see all Architectural elements, change the **Discipline** parameter in the **View's Properties** palette either to **Architecture** or **Coordination**.



Repeat this for the rest of the views.

- h. Choose **Copy/Monitor** again. This time choose the **Copy** tool as there are no existing grids in the plan.



Choose **Multiple** in the **options bar**, select all grids, click **Finish(1)** in the options bar and then **Finish(2)** in the **Copy/Monitor** tab.

The grids will be created and associated to the Architectural grids and a Monitor icon will appear. From now on any changes in the Architectural grids will be highlighted.

#### Step 4: Copy Structural Elements from the Architectural Model

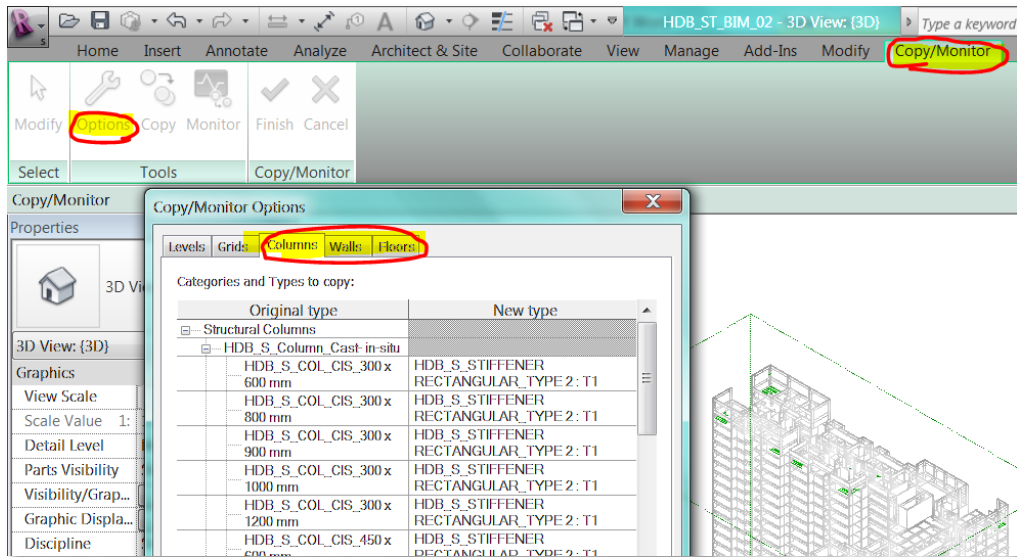
- a. Switch to 3D view, Duplicate and do the necessary visibility settings for the Coordination view (similar to steps done in the plan view).

- b. Choose **Copy/Monitor** again, choose the **Options** in the tab to set the correct family type mapping for Columns, Walls and Floors. The **Original type** refers to the family and type from the Architectural Model, while the **New type** refers to the family and type that is going to be created. If the family is not found, it is recommended to create the family before carrying out this step.

In the options dialog box there may be an option **Copy Original Type**. This allows the user to create a **New type** from the **Original type**.

#### Note:

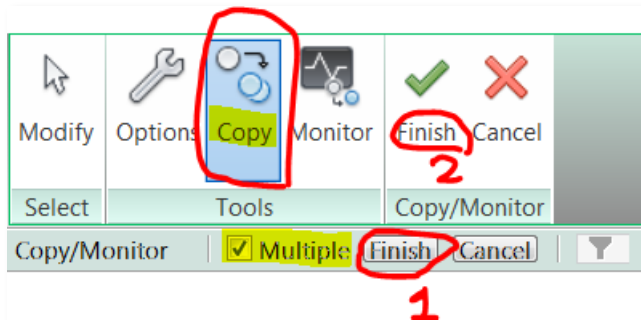
If this option is used, there will be some redundant types of families that need to be cleaned up.



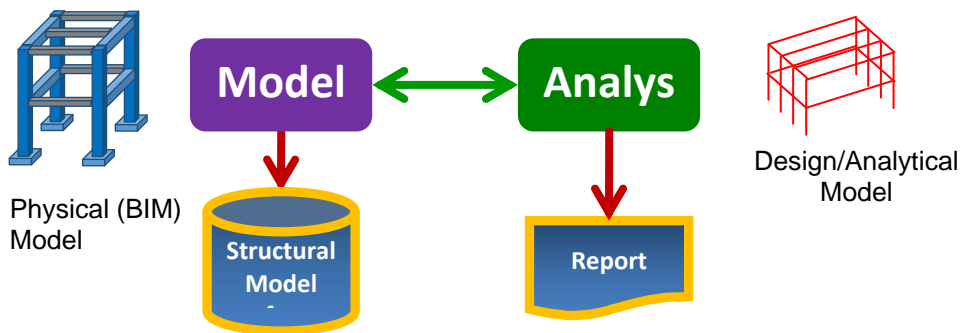
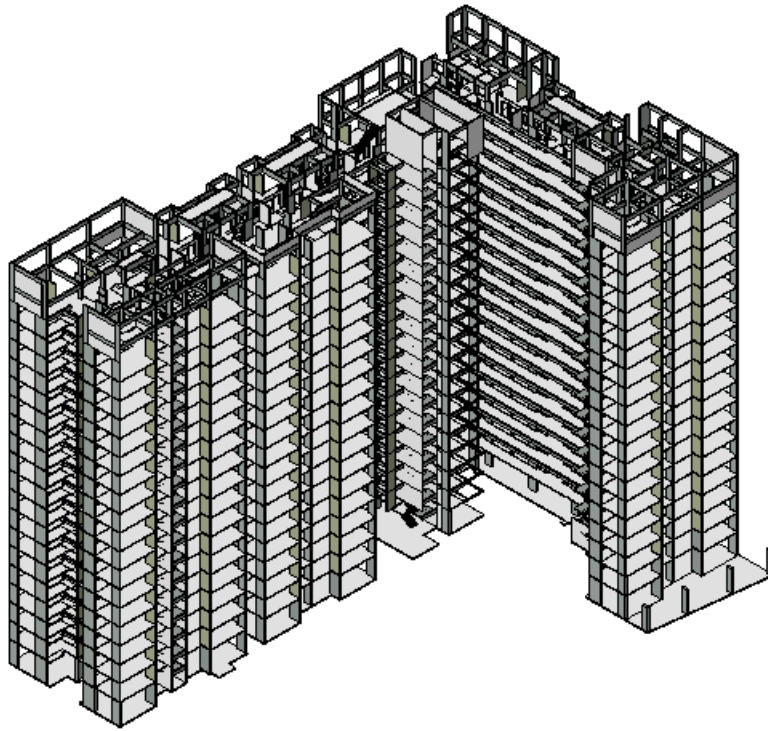
**Note:**

Choose “Don't Copy This Type” for families/types that are not required in the project.

- c. After the options are set correctly, Choose the **Copy** tool.



- d. Choose **Multiple** in the **Options bar**, and select all the columns, structural walls and slabs in the link. Click **Finish (1)** in the options bar and then **Finish (2)** in the **Copy/Monitor** tab. This will create the equivalent elements and associate them to the Architectural Model.
- e. Repeat **Steps 4(b) to (d)** for the rest of the floors.
- f. Add the Beams with approximate size for each floor. After the model is completed it is ready to be exported into Design/Analysis tools.



- g. Alternatively, use the Design/Analysis tool to determine the size and design of the members, and produce the member detail drawings from the design tool.

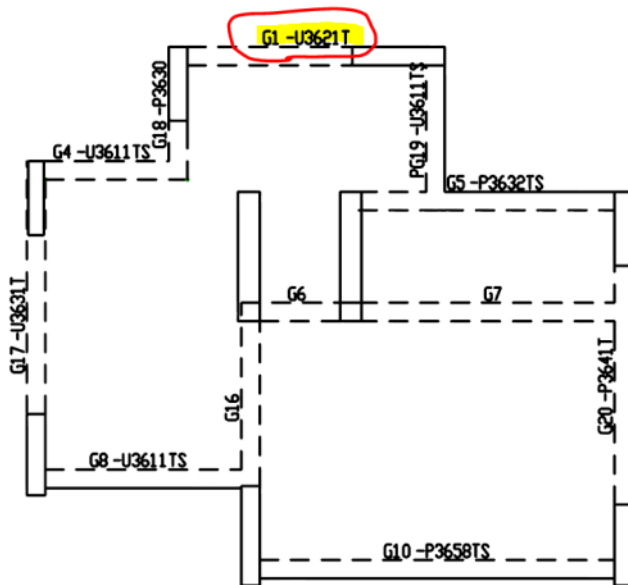
- h. Update the Structural BIM model with the member sizes and markings generated from the Design/Analysis tool. A sample is shown below.

BEAM CAGE SCHEDULING TABLE																
Item	Project	Phase	Beam Size	Span	Support	Reinforcement	Remarks	BEAM CONNECTION DETAILS				BEAM CONNECTION DETAILS				
								Detail No.	Detail	Detail No.	Detail	Detail No.	Detail	Detail No.	Detail	
G1	-	-	300	600	2675	-	U3621T	-	-	-	-	-	-	-	-	-
G2	-	-	300	600	1450	-	P3630	-	-	-	-	-	-	-	-	-

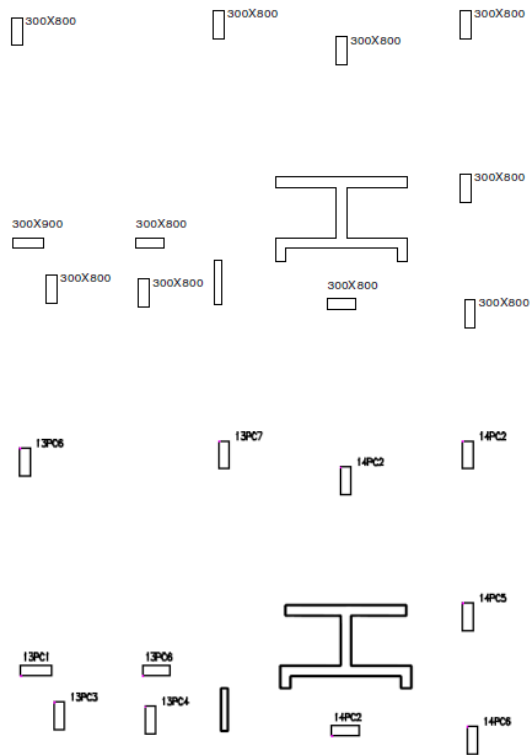
Beam Marking	Precast Beam Type	Beam Size		Beam Clear Span(L) (mm)	Precast Beam Span (mm)	Beam Cage Code	Pocket		
		Width(B) (mm)	Depth(D) (mm)				No.	Length(L)	Base Thickness(T)
G1	-	300	600	2675	-	U3621T	-	-	-
G2	-	300	600	1450	-	P3630	-	-	-

The plans generated from the Design/Analysis tool shows the location of the beam. A part of the plan is shown below.





The Column sizes and markings can be obtained from the plans generated from the Design/Analysis tool.



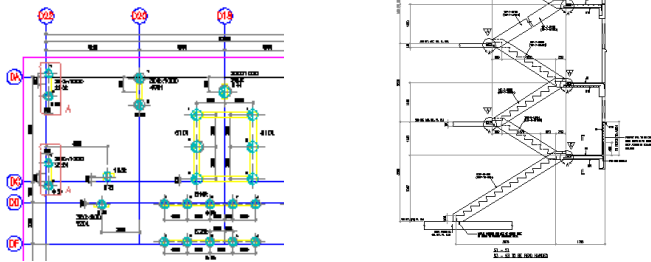
- i. **Once the model is completed, the model can be shared with other disciplines for design coordination.**

## 8.2 Detailed Design

In the Detailed Design stage, the Preliminary Design model will be further developed with more accurate BIM elements. Additional BIM elements need to be added to complete the model as well. Refer to **HDB's BEP Template** for a list of typical BIM elements that need to be modelled.

Some examples of the additional elements are listed below.

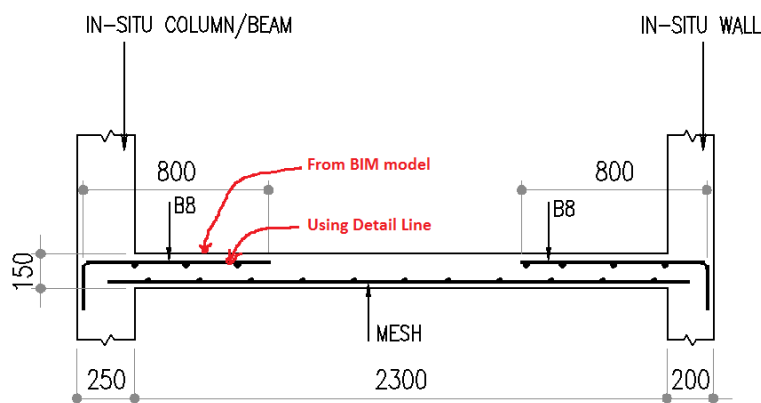
- Stairs (not the complete detail),
- Precast parapet for the details
- Piles and Pile caps



### **Deliverables:**

- Structural BIM model for Tender with drawings highlighted in the next section.
- Structural BIM model for Regulatory Approval  
Please refer to Structural BIM e-Submission guides for Specific Requirements of the Agencies

**2D information** can be used to complement the BIM model to improve the detail of the model. Ex. Detail lines can be drawn to represent the **Rebar** in a section cut from the BIM model.



**CASE 1**

### **Note:**

Column Schedule, Beam Schedule, Member Details and Reinforcement arrangement plans can be produced from the Design/Analysis tools as 2D DWG/DXF and inserted into the BIM model file.

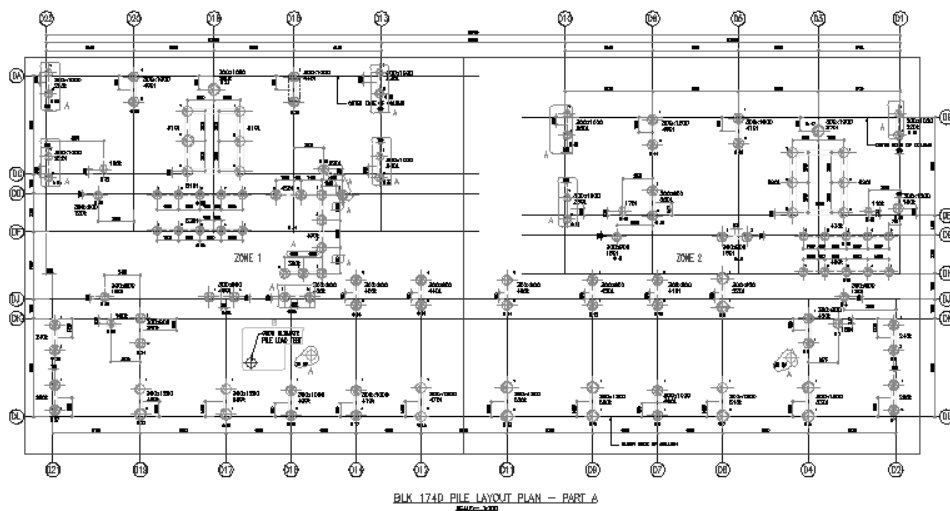
The following are some of the drawings to be produced from the model in the **Detailed Design** stage:

DRAWINGS	SCALE
1. PILING LAYOUT PLAN	1:100
2. 1ST STOREY GENERAL ARRANGEMENT PLAN	1:100
3. 2ND STOREY GENERAL ARRANGEMENT PLAN	1:100
4. TYPICAL FLOOR GENERAL ARRANGEMENT PLAN	1:100
5. MAIN ROOF GENERAL ARRANGEMENT PLAN	1:100
6. GENERAL ARRANGEMENT PLAN OF WATER TANK & PUMP ROOM	1:100
7. GENERAL ARRANGEMENT PLAN OF LIFT WELL & STAIRCASE ROOF	1:100
8. ELEVATIONS	1:100
9. SECTIONS	1:100
10. TYPICAL DETAIL SECTIONS (ACROSS THE BUILDING IN SELECTED LOCATIONS)	VARIES

Additional drawings may need to be produced, depending on the requirements of the project.

**Step 1: Create a Pile Layout Plan**

a. A sample of a Pile Layout Plan is shown below.

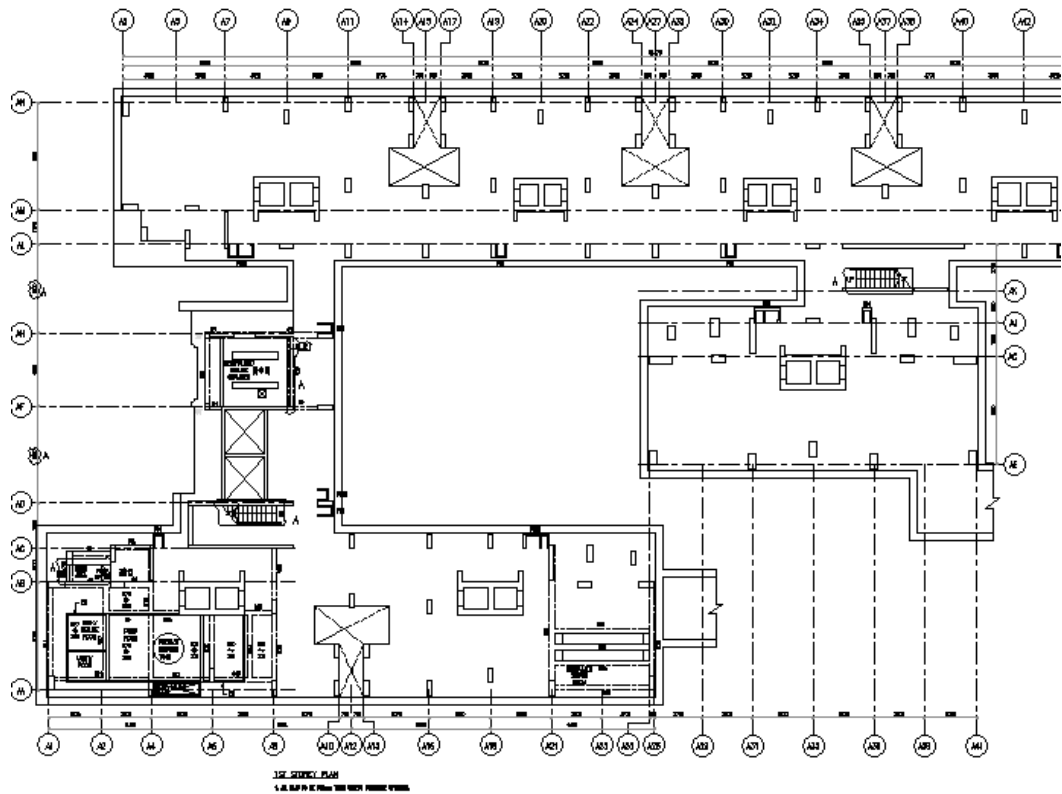


Add the following annotations to the plan view:

- Grid dimensions;
- Markings;
- Size;
- Load;
- Setting outs and
- Zones

## Step 2: Create a 1<sup>st</sup> Storey General Arrangement Plan

a. A sample of a 1st Storey General Arrangement Plan is shown below.

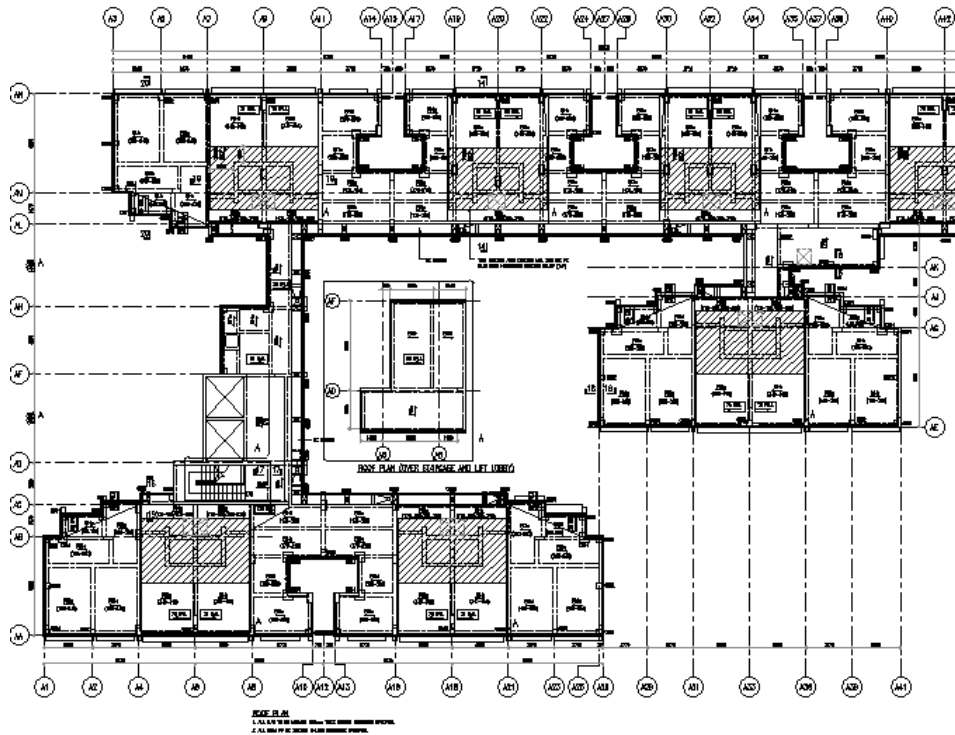


Add the following annotations to the plan view:

- Grid dimensions;
- Markings; and
- Size

### Step 3: Create a Roof General Arrangement Plan

a. A sample of a Roof General Arrangement Plan is shown below.



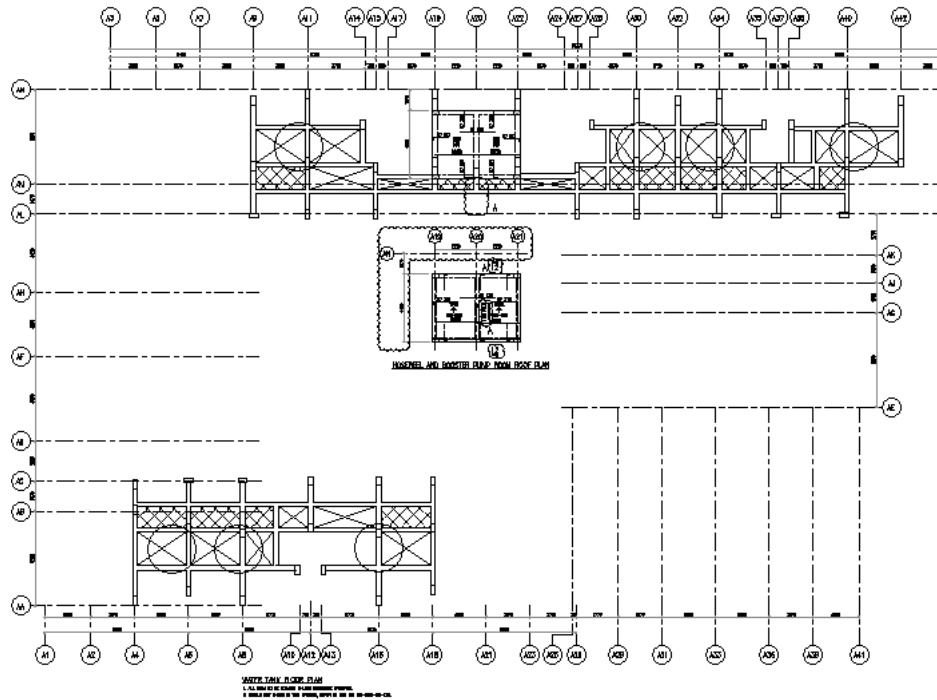
Add the following annotations to the plan view:

- Grid dimensions;
- Markings; and
- Size

Additional indication of Slab thickening above the **House Hold Shelter** is shown with a hatch pattern.

**Step 4: Create a Water Tank General Arrangement Plan**

a. A sample of a Water Tank General Arrangement Plan is shown below.

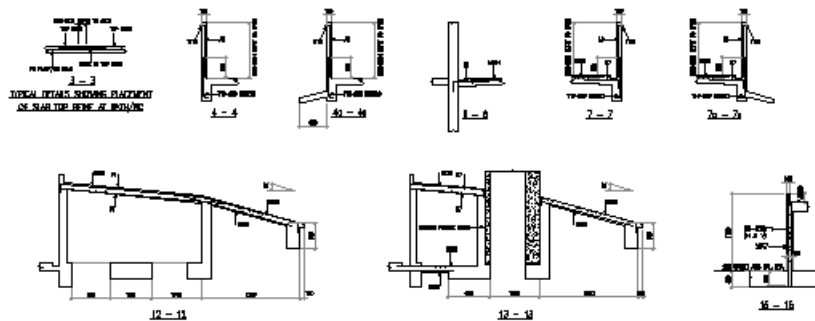


Add the following annotations to the plan view:

- Grid dimensions;
- Markings; and
- Size

**Step 5: Create Details**

a. Samples of some Details are shown below.

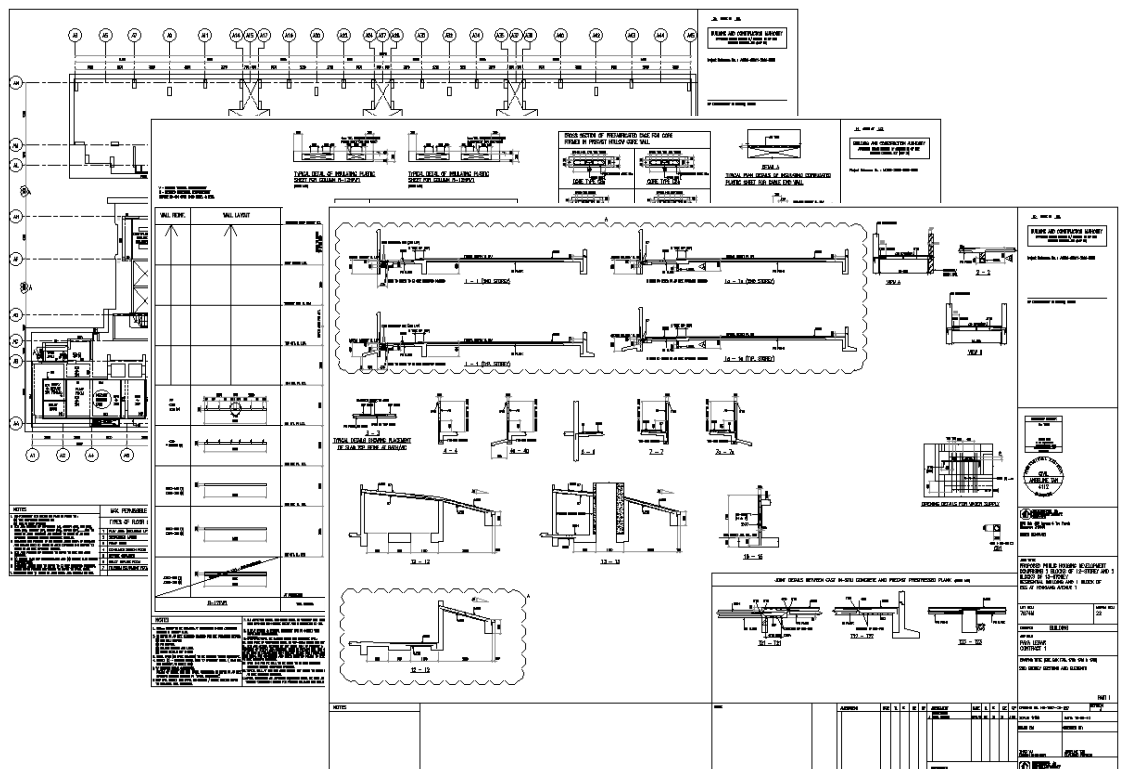
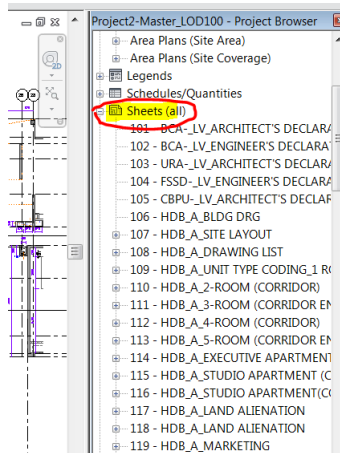


Add the following annotations:

- Dimensions;
- Member Markings;
- Rebar Annotations; and
- Slopes

## Step 6: Create Sheets and Publish for Submission

- a. After the views are ready create the Sheets, drag the views into the sheets and complete the documentation process.



- b. **Publishing Model and Drawings to Non-editable File Format**

Refer to Structural BIM e-Submission Guideline for step-by-step guide to export/ publish to DWF/PDF for regulatory submission.

### Note:

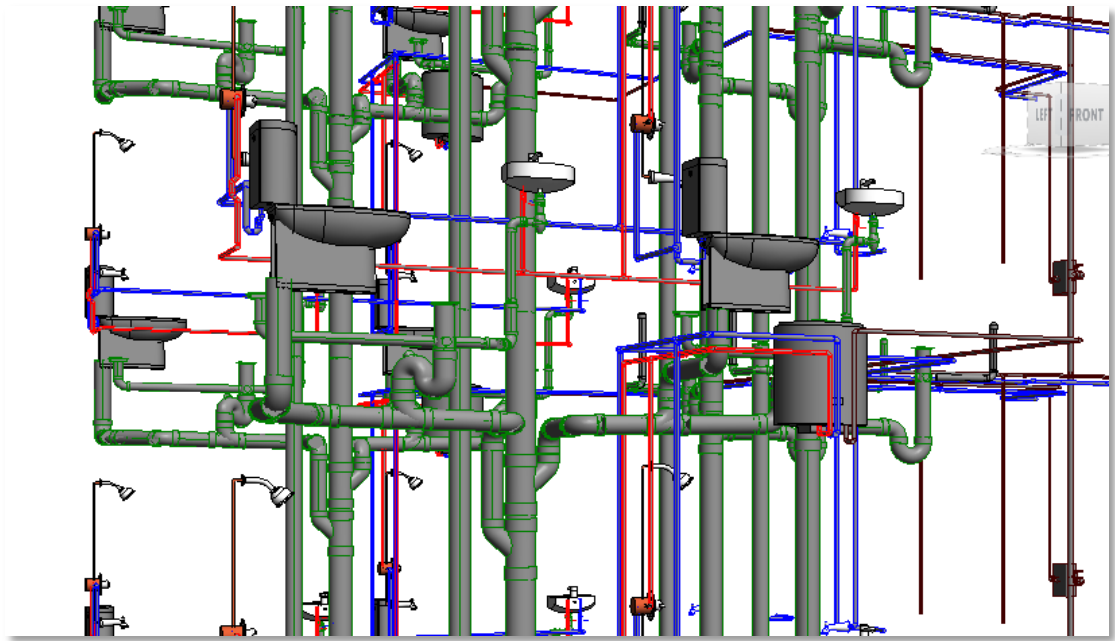
The drawings produced from the BIM model during the Detailed Design stage can form part of the tender documents together with other 2D detail drawings.

## 9.0 MECHANICAL & PLUMBING MODELLING

This chapter on BIM Modelling for Mechanical and Plumbing covers the Water and Sanitary services. The concept for the rest of the M&E services is similar.

### 9.1 Conceptual Design

Conceptual Design for Mechanical and Plumbing covers basically the steps required for creating the Schematics. BIM modelling is not required.



#### Schematics

**Objective:** Create a single line diagram that shows the distribution of the system into the HDB block.

**Deliverable:** Schematic Diagrams

#### Procedures:

BIM authoring tools do not have the capability to generate schematic diagram automatically from the model at this moment. It is recommended to follow either one of the options below to generate Schematic Diagrams.

- Schematic Diagram using traditional 2D method in AutoCAD
- Schematic Diagram using BIM tool

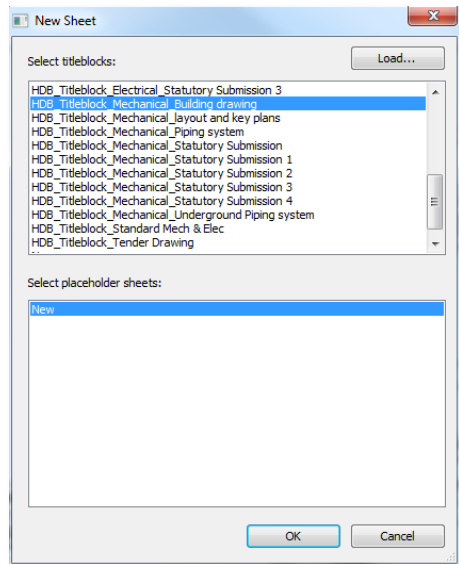


## Schematic Diagram using Traditional 2D Method in AutoCAD Application

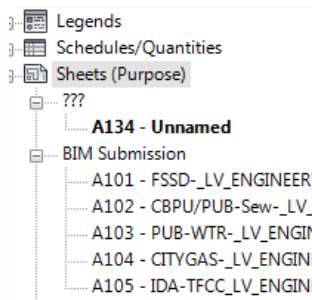
Schematics created in AutoCAD can be loaded directly to Revit through the following steps:

- a. Create a new Sheet from the View Tab of Revit.

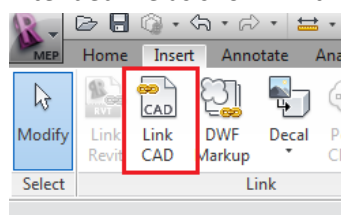
**View → Sheet**



- b. Select the title block based on the system from the list of the title blocks shown in the New Sheet dialog box.
- c. The created new sheet for the schematic diagram will be placed under the non-category (???) views on the project browser. Right click on the created sheet and rename it based on the BIM e-Submission requirements.



- d. Insert the pre-created 2D CAD drawing through **Insert** tab → **Link CAD** then choose the intended file as shown in the image below.



## Schematic Diagram using BIM Tool

It is advisable to import the symbols and typical details that already created in CAD. This is to save time in creating the schematic diagram. Below steps are need to follow to finish the schematics.

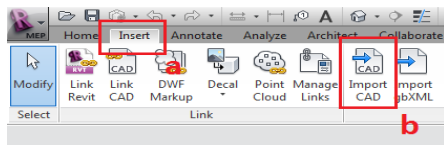
- a. Create a new Sheet from the View Tab.

**View → Sheet**

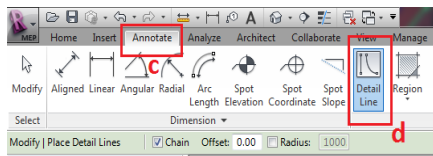
### Note:

**Drafting view can be used to create the schematic as well.**

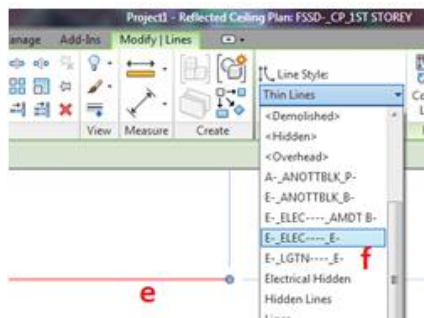
- b. Select the Mechanical Building drawing from the list of the title blocks of the template. Import the 2D symbols through **Insert Tab → Import CAD** (a and b from the figure below)



- c. Place the imported 2D symbols into the drawing and connect it using the **Detail Lines**. Use **Annotate (c) Tab → Detail Line (d) tool** to draw the Detail Lines. The steps to draw the Detail Lines are similar to creating lines in AutoCAD.



- d. Select the created lines (**e**) (shown in image below) and change the **Line Style** properties to its representing system (**f**).





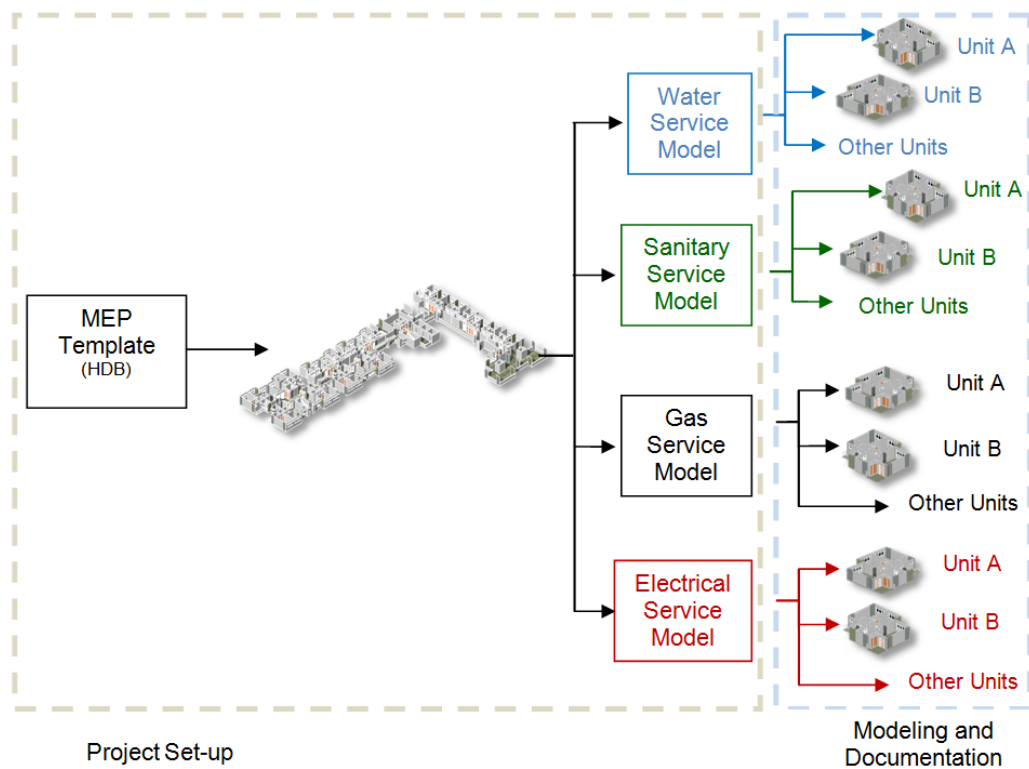
## 9.2 Preliminary Design

The preliminary Mechanical and Plumbing (M&P) BIM Model could be created from the Architectural BIM Model and serves as a preparation for the Detailed Design stage.

Before starting the actual modelling, it is recommended to go through proper planning and preparation.

### Recommended Workflow

Below is the graphical sequence of connected steps to be carried throughout the development of the model.



It is recommended to divide the project into different files for different services in order to manage file size and to delegate the task to the team members. After completion of each service, the models can then be linked together for services coordination.

## Understanding the MEP BIM e-Submission Template

The template files provide initial conditions to a project. A new project inherits all settings, families and title blocks from the template file.

### Settings





- The Project Browser of the template is organised by the different Regulatory Agencies.
- The views were enabled with Visibility Graphics → Filter (by System) as shown below.

s

### Visibility Graphics (VG):

- This is set to manage graphical display of the elements in the view.
- Systems that are not necessary in the view were properly turned off.
- Colours for the system are as per CP83 Standard.
- The modellers can go directly to the views specific for each agency/service/system and start the modelling.

Visibility/Graphic Overrides for Floor Plan: PUB-\_FP\_2ND STOREY

Name	Visibility	Projection/Surface	
		Lines	Patterns
Sanitary	<input checked="" type="checkbox"/>		
Vent	<input checked="" type="checkbox"/>		
Cold Water Supply	<input type="checkbox"/>		<a href="#">Override...</a>
Hot Water Supply	<input type="checkbox"/>		
Supply	<input type="checkbox"/>		
Return	<input type="checkbox"/>		

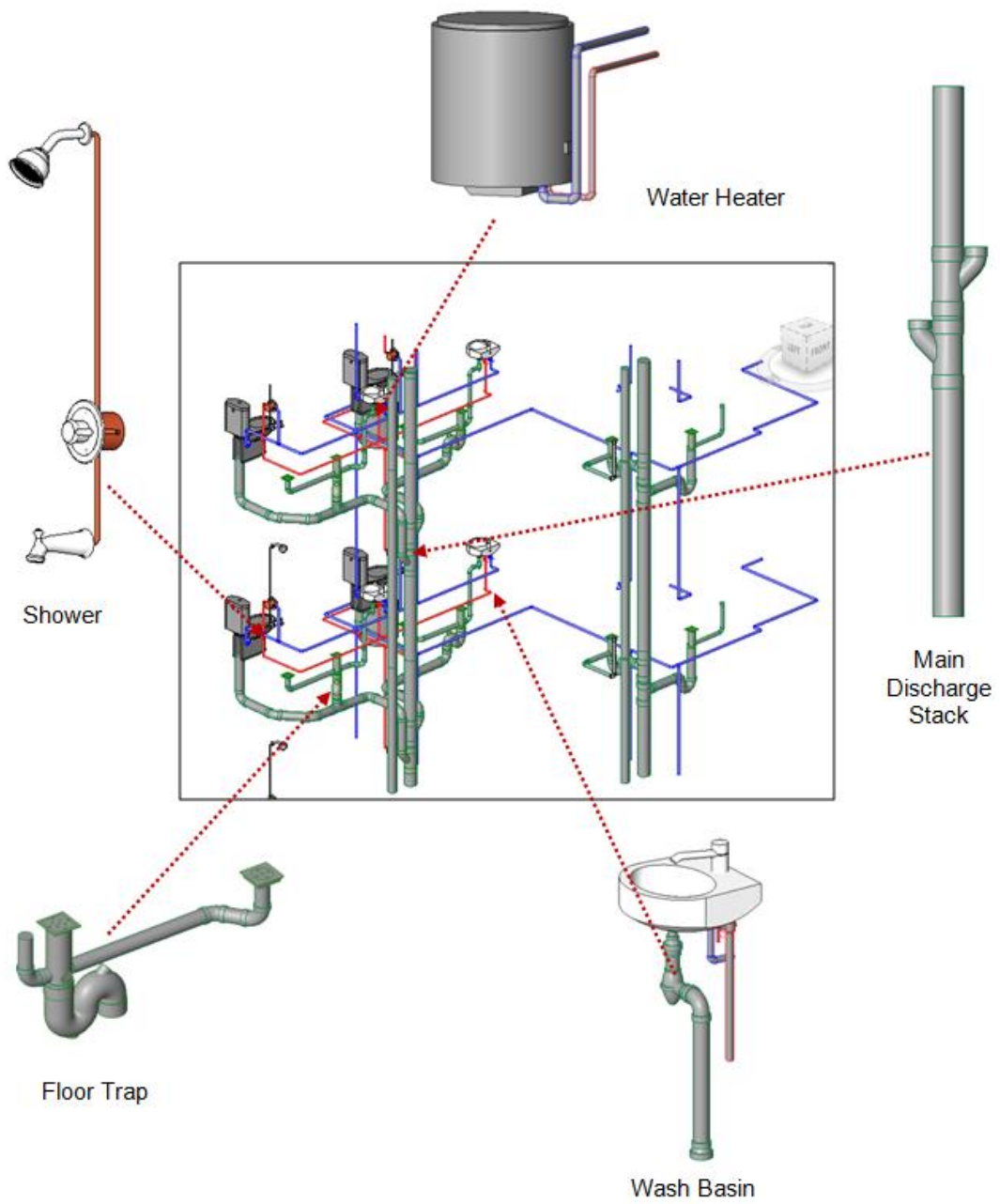
## Families and Groups

The default families available inside the template can be used for the modelling. Additional objects can be downloaded from the web and loaded into the project through Insert tab of Revit. Objects downloaded from the web should be tested for suitability and correctness before use.

In addition, some groups of interconnected families as shown in the figure below can be created inside the template. These pre-loaded objects can be placed as one and adjusted to suit the project requirements.

**Note:**

Create separate groups for families that need to be mirrored instead of mirroring the same group as the connections (hot and cold water) location will be mirrored as well.



## Title Block

Template comes with the standard title block as shown below, customise it as a company standard title block with HDB's requirements incorporated.

The image shows a standard title block template for a drawing. It consists of a large empty rectangular area on the left for the drawing content, and a vertical column of information on the right. The right column includes the following sections from top to bottom:

- CEPW P18E (Rev 3)**
- Project Details:** Project Name, Drawing No., Drawing Title, Drawing Date, Drawing Scale, Drawing Status.
- Revision Table:** A table with columns for Rev, Date, and Remarks.
- Author:** Author Name, Author Title.
- Project Description:** Project Name, Project Address.
- Drawing Title:** Drawing Title.
- Project Details:** Project Name, Project Address, Project No., Project Date.
- Revision Table:** A table with columns for Rev, Date, and Remarks.

Standard Title Block

The image shows a customised company standard title block. It features a large empty rectangular area on the left for the drawing content, and a vertical column of information on the right. The right column includes the following sections from top to bottom:

- North Arrow:** A north arrow symbol pointing upwards.
- Revision Table:** A table with columns for Rev, Date, and Remarks.
- Project Details:** Project Name, Project Address, Project No., Project Date.
- Author:** Author Name, Author Title.
- Project Description:** Project Name, Project Address.
- Drawing Title:** Drawing Title.
- Project Details:** Project Name, Project Address, Project No., Project Date.
- Revision Table:** A table with columns for Rev, Date, and Remarks.

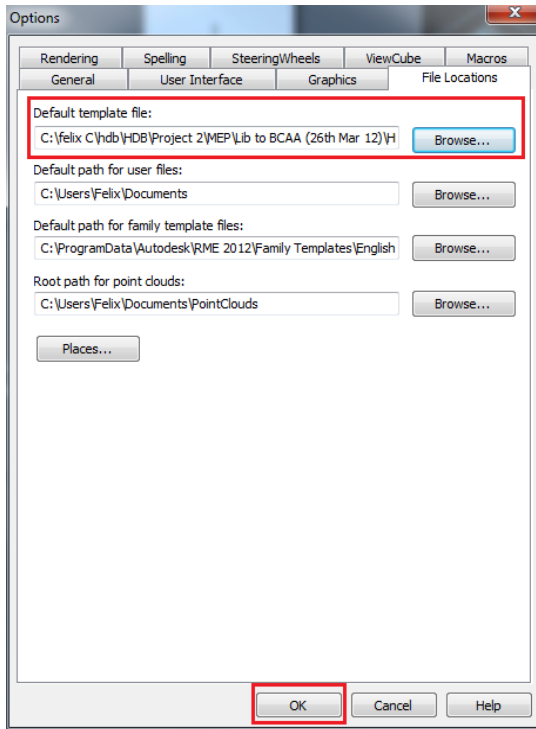
Customised Company Standard Title Block




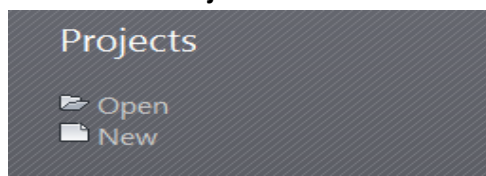
## Project Setup

Files needed: Architectural Model and the Project template.

### Step 1: Loading the Project Template



- From the Application Menu , click on the **Options** button.
- Under the File Location, browse for the Project template. Click **OK** once done.
- Click on **New Project** to start.



## Architectural Model Validation

The basic elements required from the Architectural BIM Model for the M&P BIM model are as listed:

- Plumbing Fixtures
- Water tanks
- Ceiling
- Floors
- Riser's location
- Inspection Chamber
- Grids
- Levels

The elements, especially MEP fixtures, should be placed realistically on the architectural plan for proper modelling of required MEP systems.

### Step 2: Linking Architectural Model

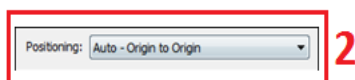
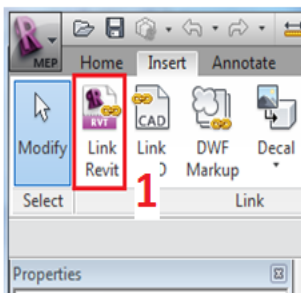
Refer to Section 3.1 for the basic elements required from the Architectural BIM Model for the M&P BIM model. The elements, especially MEP fixtures, should be placed realistically on the architectural plan for proper modelling of required MEP systems.

- Go to **Insert Tab** and choose **Link Revit**

#### Note:

**It is good to link the individual storeys one by one rather than the entire block (Master File). This is to manage the file size and prevent system lag during modeling process. Combining the M&P model can be done once typical floor is completed. The steps will be discussed in the later chapter.**

- Link the model using Origin to Origin Positioning in order to place in the same position as Architectural model.




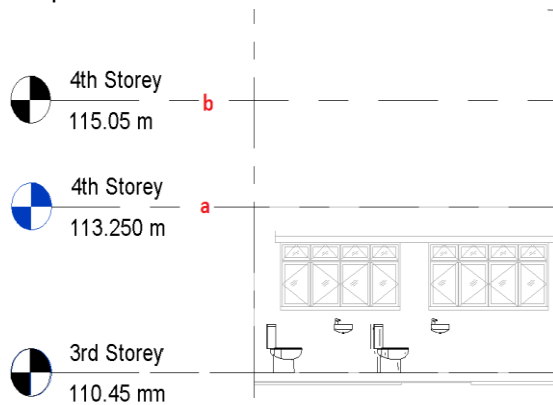
**Note:**

If the Central Architecture Model will be used, all nested links must be set as OVERLAY in the Reference Type under Manage Links dialog box. This is to properly see the model in your working window.

### Step 3: Adjusting MEP Levels and Creating Grids

Adjusting MEP Levels with the Architectural Model

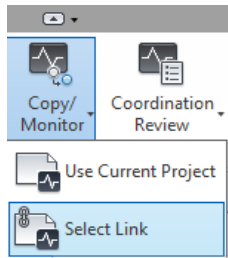
- a. On the project browser, open one of the Elevation views.
- b. In the Elevation view, click the **Align** tool  under the **Modify** tab.
- c. Select the Level of the linked architecture model, (**a** in the left figure) then select the MEP Level that intended to move (**b**). Grid will be aligned accordingly.  
Repeat for the rest of the levels and rename them if necessary.



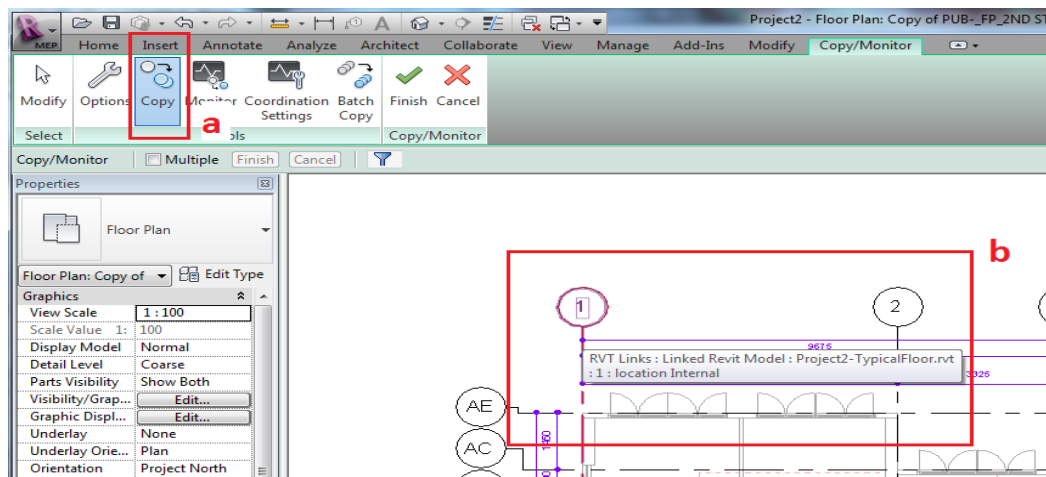
#### Step 4: Copying and Monitoring Project Gridlines

Copying and monitoring the project gridlines is one of the best practices in modelling services of the project. The grids would be updated to reflect the changes made in the Architectural BIM model.

- a. From the **Collaborate Tab**, click **Copy/Monitor Tool** then choose **Select Link** from the 2 given options.



- b. Select the linked architecture model.
- c. Select Copy tool from the ribbon (a) from below figure and click the Grids in the linked model (b).



### Creating Base File for MEP Services

- a. The separate project base file should be created for MEP services and used to model different portions of the project. This allows linking the individual portions of the model smoothly to the central file that shows the complete assembly of the project.  
Copy the project file that was set based on the number of services to be modelled.

### Preliminary Design Modelling

- a. Create a copy of the Project Base File discussed in the previous item. Copy the fittings from the Architectural Model and model only the main distributions of the project.
- b. Choose the families/types for the MEP components. Components can be placed with approximate sizes and in approximate location as there may not be enough information at this stage. Refer to **HDB's BEP Template** for the list of BIM elements to be modelled by the MEP discipline. Users shall follow a standard naming convention.
- c. **Share the Preliminary Design model with the Design Team for co-ordination.**

### 9.3 Detailed Design

In the Detailed Design stage, the Preliminary Design model will be further developed with more accurate BIM elements, based on feedbacks from the Technical Departments and other disciplines. Additional BIM elements need to be added to complete the model as well. Refer to **HDB's BEP Template** for a list of typical BIM elements that need to be modelled. Elements should be with an accurate dimensions, shape and location. Non-geometric properties should be provided.

***Deliverables:***

a. Tender BIM Model with drawings

Content:

- Layout and Key Plans
- Site Plans
- Floor Plans

b. Submission BIM Model for Regulatory Approval

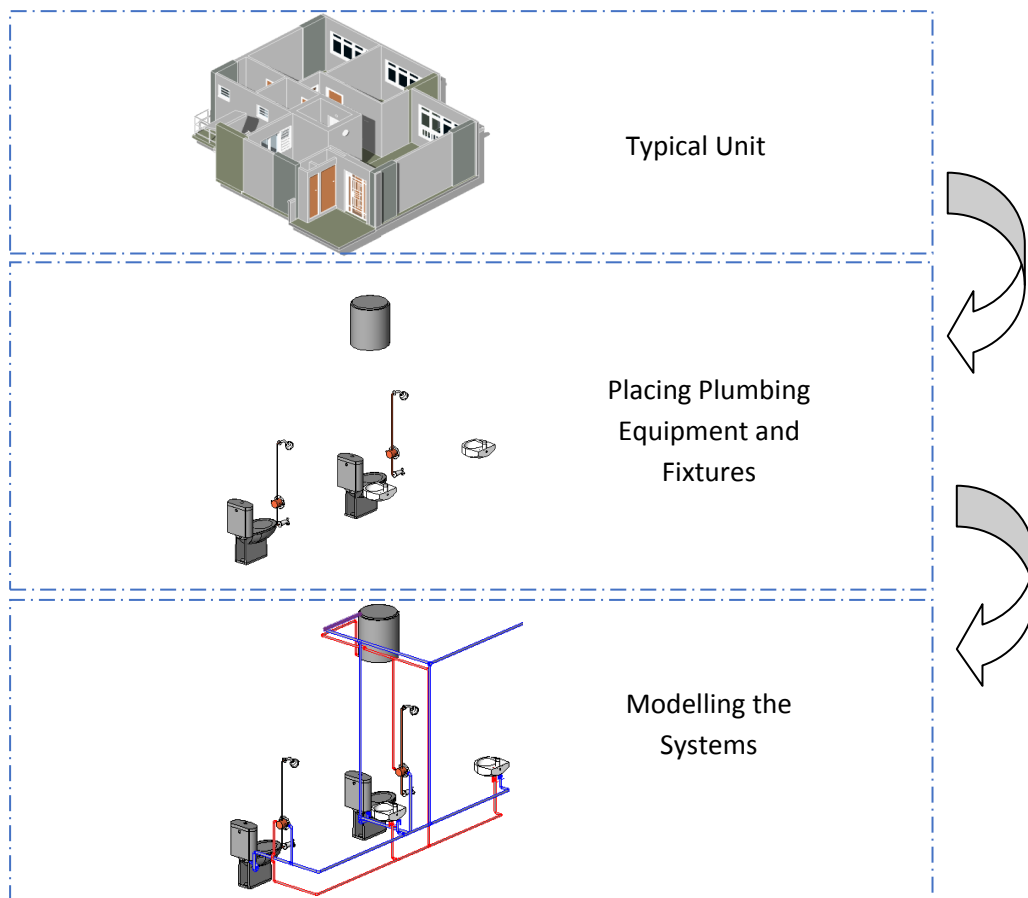
Please refer to MEP BIM e-Submission guides for Specific Requirements of the Agencies

This sub-chapter will be divided into different services namely:

- Water and Gas Services
- Sanitary Service and
- Electrical Service

## 1. Modelling Water and Gas Services

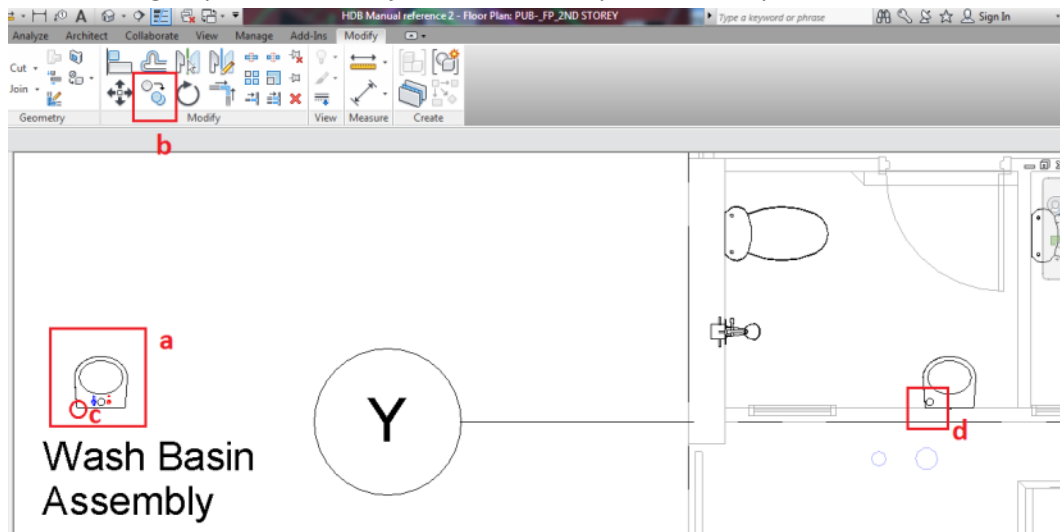
After the project has been set up, the water and gas services can be modelled in the manner illustrated below.



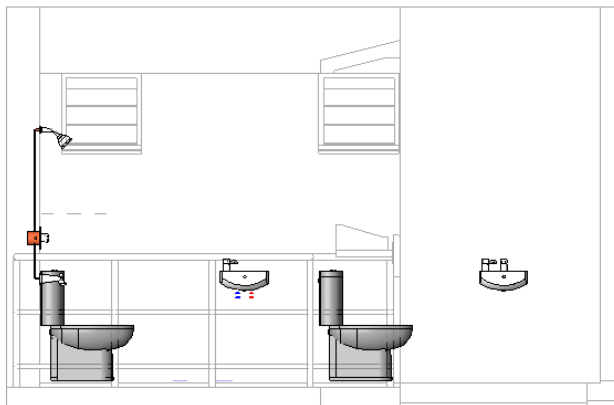
## Step 1: Model Plumbing Fixtures

Open the base file that was created for Water and Gas services.

- Choose Wash Basin Assembly from the list of preloaded assemblies in the template (letter **a** from the figure below) and copy (**b**)
- Pick the start point of copying. (**c**)
- Place the copied assembly to the same position of the fixtures of the architectural model. (**d**)
- Parts of the groups should be adjusted if necessary to fit the required clearances.



- Load other plumbing fixtures from the library folder if necessary and do the above steps.
- After the above step is done, the model will look like the image below.



### Note:

In detail design stage, elements should be placed into the ideal position. Therefore, offset or level of the elements with reference to the finish floor level is one of the factors should be considered in modelling.



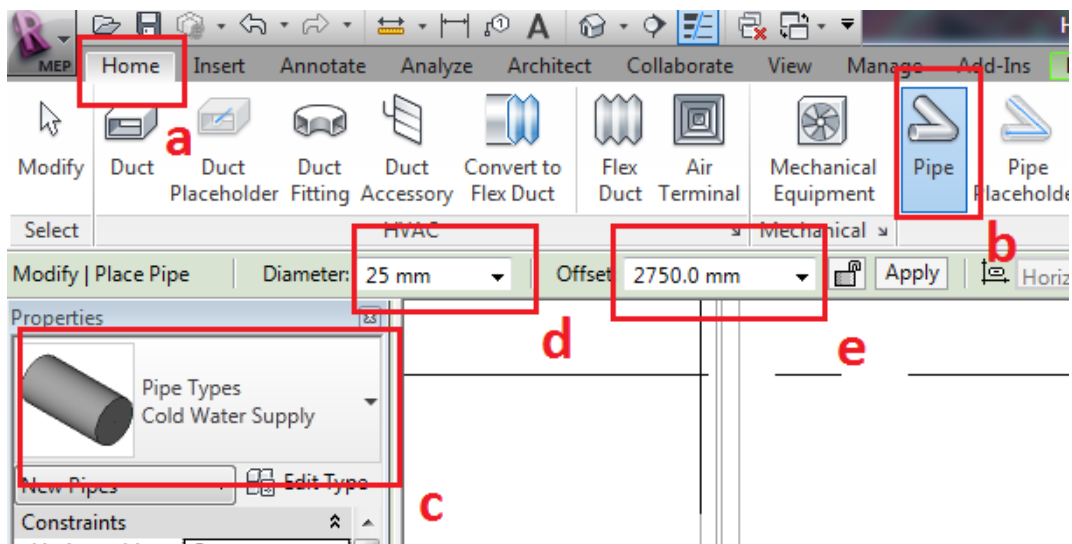
## Step 2: Model Connections

When all plumbing fixtures necessary for the water and gas services of the unit were placed, modelling connections with piping will then be the next. In modelling piping systems, below are the settings to be considered:

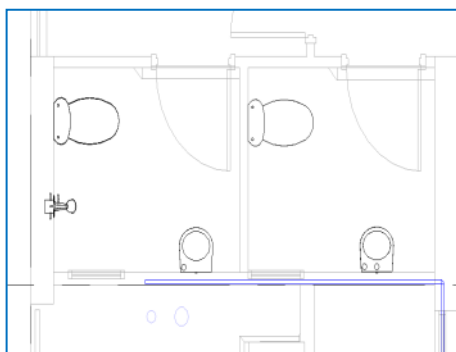
- Pipe Materials
- Pipe System
- Size (please refer to HDB standard pipe sizes)
- Level or Offset from finish floor level

The following steps will lead the modellers to get this done.

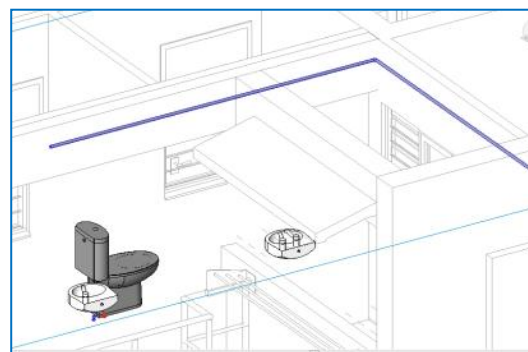
- Choose pipe tool from the Home tab of Revit. ( Letter **a** & **b** from figure below)
- Select the type of pipe to be used from the Property tab of Revit. (**c**)
- Choose the required diameter of the pipe for the pipe specified. (**d**)
- Set the required offset from the finish floor level of the model. (**e**)



Model and place the pipe into its ideal location. The modeller should verify the design whether the pipe should be embedded or exposed to the wall.



Plan View



3D View

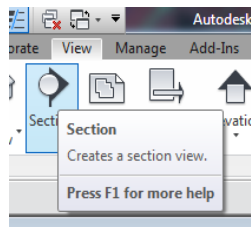
### Step 3: Connect Water Fixtures with Pipe System

It is advisable not to create all elements in one view (e.g. plans) as some elements are much easier to model and connect properly in other views (e.g. elevations and sections).

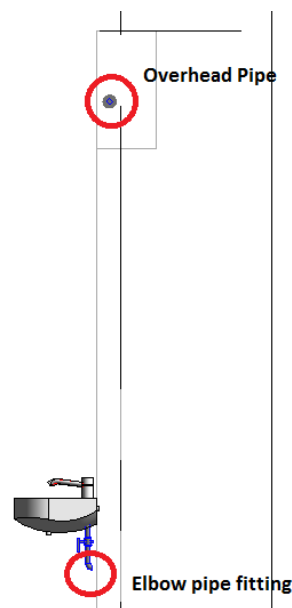
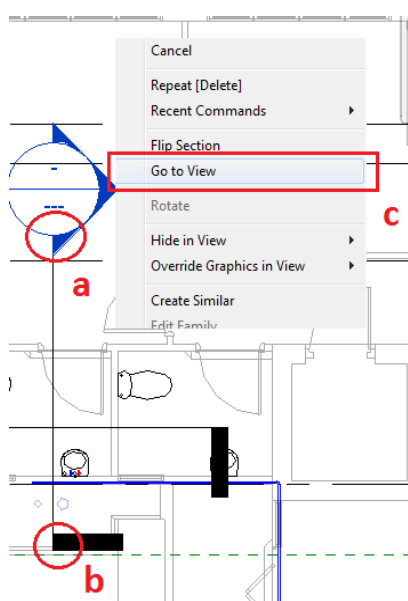
In the following steps, the pipe will be connected to the wash basin in section view.


- Cut a section into the floor plan.

**View tab → Section.**



- Draw a section line from point **a** to point **b**, as shown in the figure below.
- Once the section is created, **right click** on it and choose **Go to View**. (c) The Section created will be displayed.



- On the Section View, select the elbow fitting and select the **Connect Into** (  ) tool on **Modify** tab of Revit.
- Then choose the overhead pipe to connect.
- Repeat the above steps to connect the other fixtures.

## Connecting Pipe Directly to the Fixtures

Before the pipe is connected to a particular plumbing fixture, there should be a basic understanding of the properties of the fixture or equipment. . The properties of components may vary based on the category. The wash basin is used as an example here.

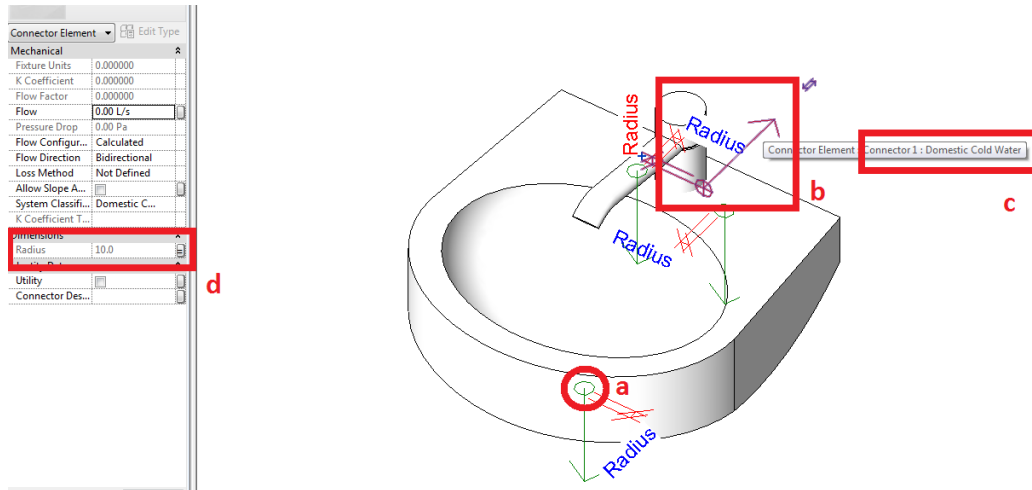


Figure taken from family editing window

Where:

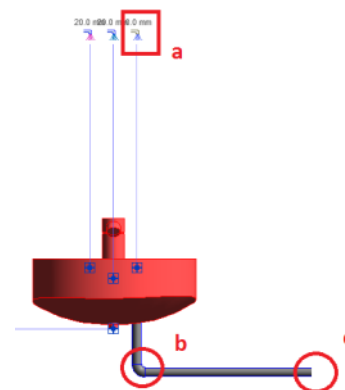
- a** = point of connection
- b** = direction of the pipe to be connected
- c** = name and the system property ( ex. Cold water, hot water, etc. )
- d** = dimension of the connection port

### Note:

Warning might appear during modelling due the above properties.

The steps below can be applied to the fixture or equipment that is not connected to any system yet.

- a. **Cut sections** in the model showing the connection point of the fixtures and the preferred route of the pipe.
- b. **Select** the fixtures, Revit will show you the different connection points of the fixture. **Pick the system** (a from the left figure) to be created and move the mouse to the preferred route. (**b & c**) On the other hand, **right click** to the connection point and choose **Draw pipe**.



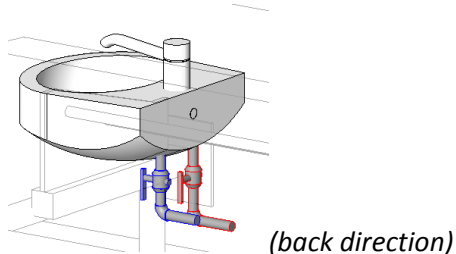
- c. Repeat the above steps for the other fixtures if necessary.

## Modifying Groups

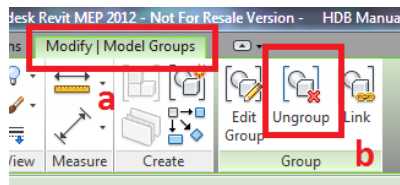
Group of interconnected families that are pre-loaded could be modified in order to suit the design requirements.

Below are the steps to get this done.

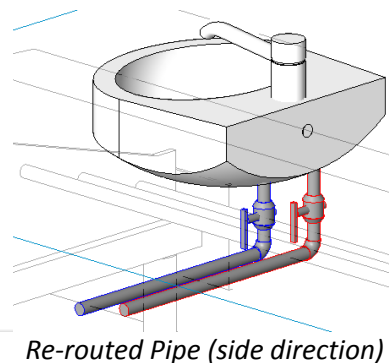
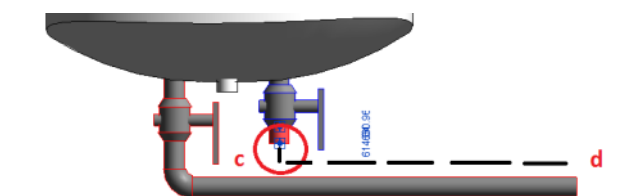
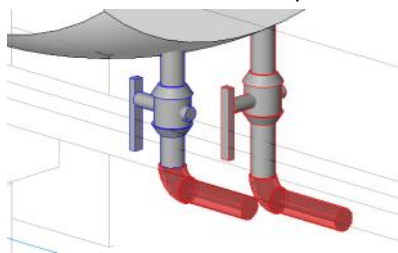
On the example below, the pipe connection will be changed from back direction to side.



- a. **Select the group** and click **Ungroup** from the Modify tab. (a & b from the left figure)  
Select and edit each element from group.



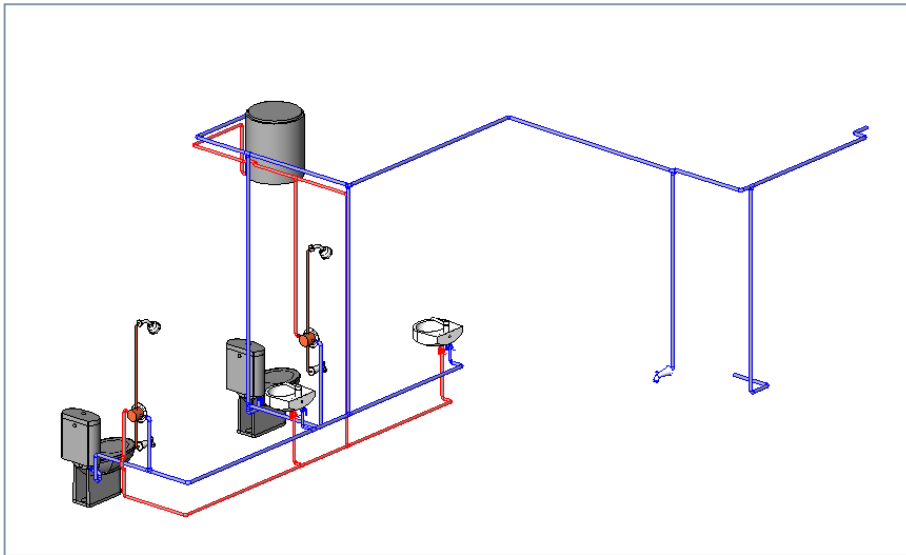
- b. Choose a convenient view to **select** the elbows together with the pipes that need to be re-routed. Press **Delete** key on the keyboard.
- c. **Select the pipe** and **right click** to its end point (c) and choose **draw pipe** from the options. Move the mouse to the prefer direction. (d)



### Modelling tip:

Risers and other vertical parts of the system are much easier to create in section or elevation view of the model.

The completed water system is shown below.



The unit can then be mirrored or copied to complete the whole floor.



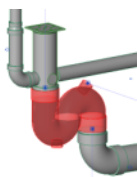
Now the model is ready for documentation.

## 2. Modelling Sanitary System

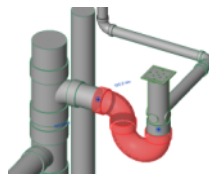
The settings listed below should be considered when modeling the sanitary system of a residential block. References should be made to the prevailing statutory regulations and HDB standards:

- Pipe Materials and Fitting to be used in the systems
- Pipe System
- Size
- Level or Offset from finish floor level
- Slope

Recommended fittings for the sanitary system in a HDB residential block:

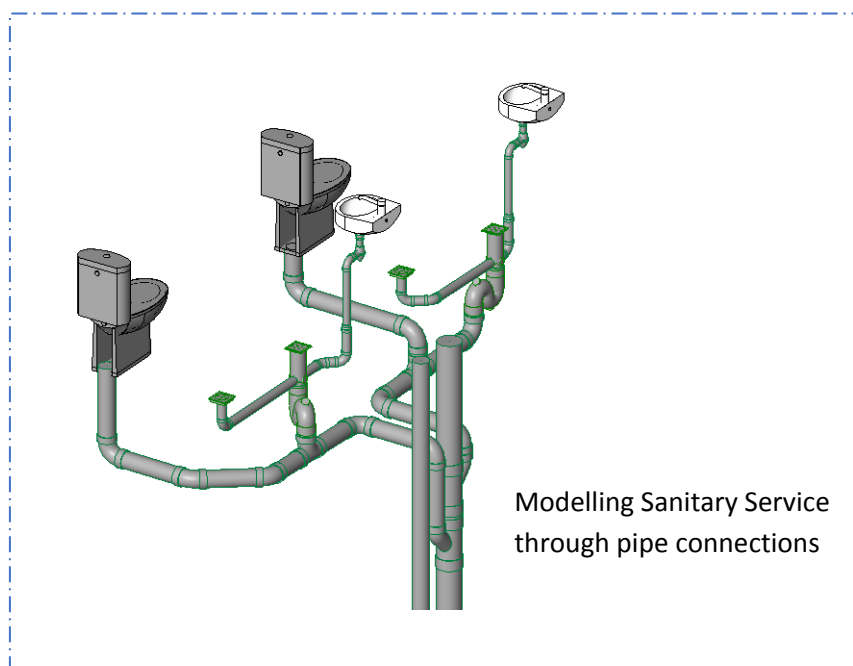
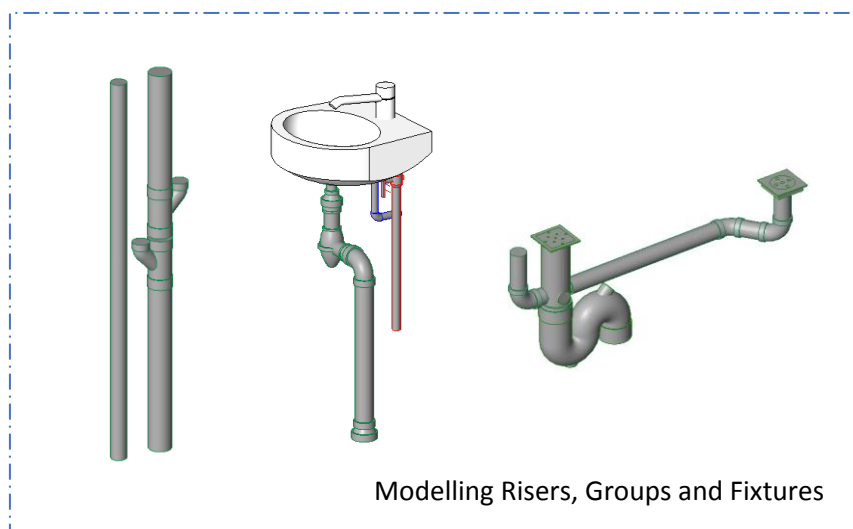
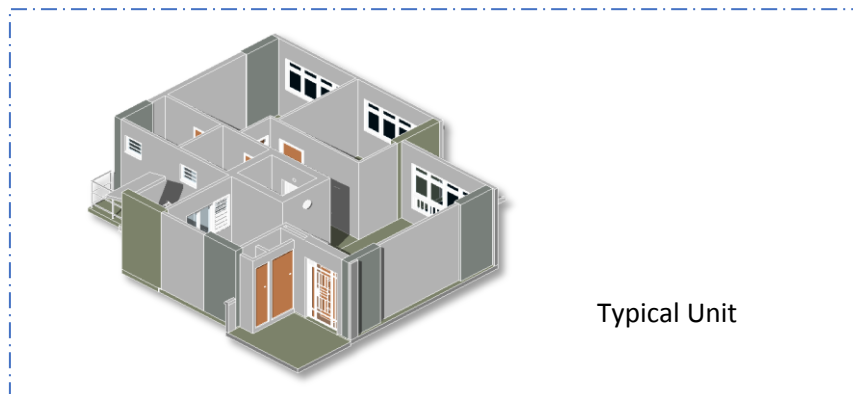


**Floor Trap for toilet**



**P-Trap for kitchen area**

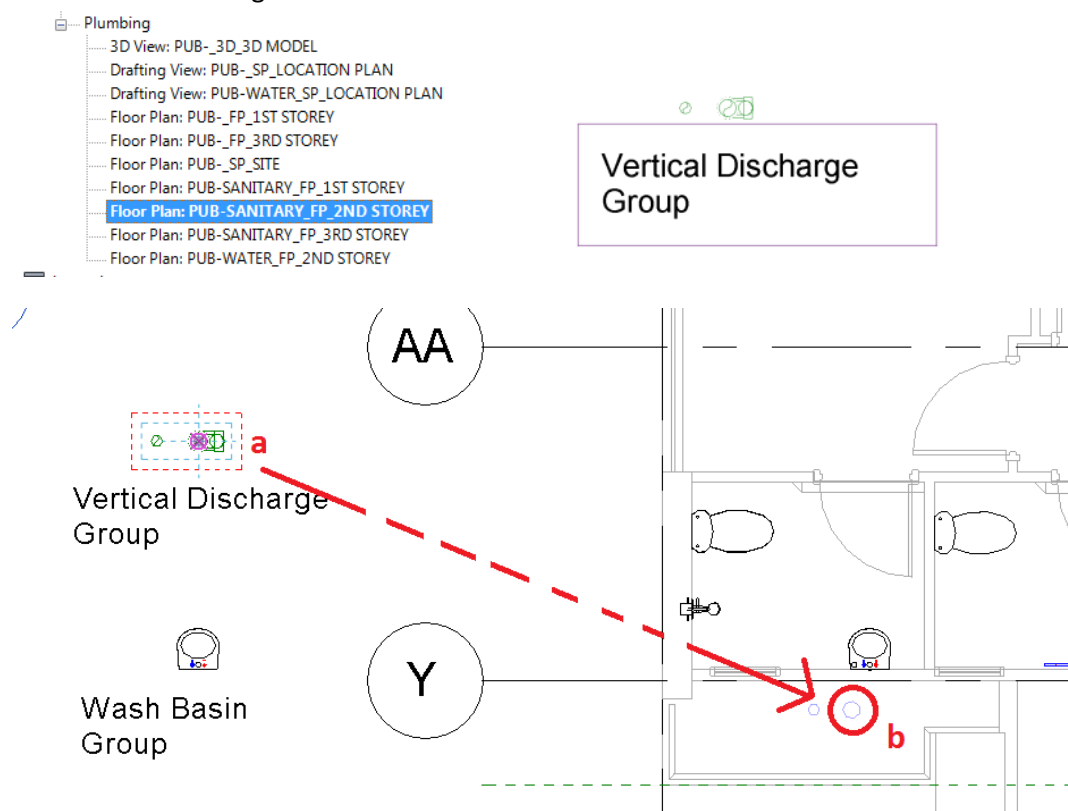
Recommended Workflow for modelling Sanitary System of a HDB residential block:



## Step 1: Model Main and Secondary Discharge Stack

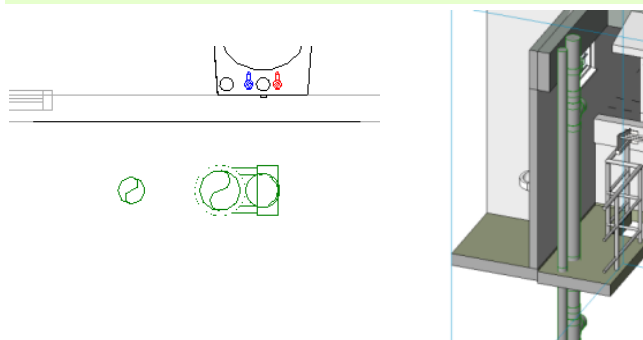
Modelling the risers for Main Discharge Stack (MDS) and Secondary Discharge Stack (SDS) can be modelled with the following steps.

- Extend the Plumbing Category on the project browser and double click **PUB-SANITARY\_FP\_2ND STOREY**.
- Create a group for the Vertical Discharge Stack.  
**Select the Group → Modify tab, Copy**
- Pick the center of the MDS pipe as a Start point of placing ( **a** from the figure below) and put it at the center of the circle mark ( **b** ) provided in the architectural model. Please refer to the below figure.



### Modelling Tips:

To get a perfect center snapping, while moving the element to the intended location, right click on the reference point and choose Center. When the center of the circle is highlighted, click once more.

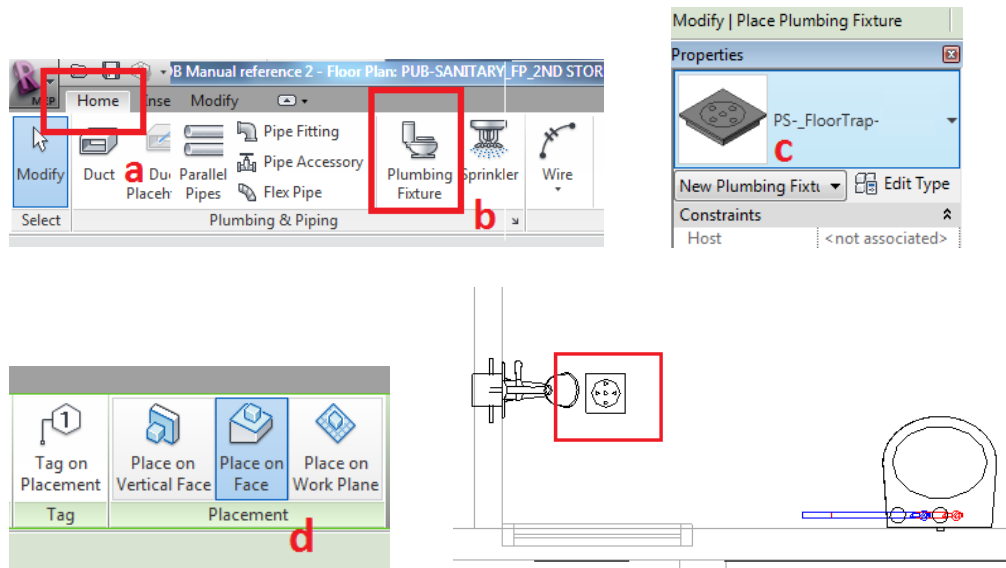




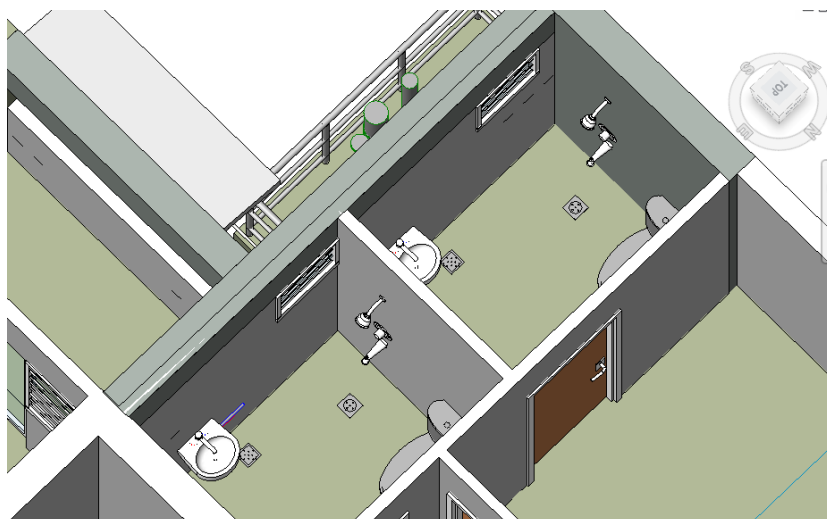
## Step 2: Model Floor Traps

Floor traps and floor drains cannot be placed without the hosting elements such as floors or slab. Placing of these elements in the model can be done through following the steps below.

- a. From the Home tab, (a from the left figure) choose Plumbing Fixtures. (b)
- b. From the Property panel, pick the required floor trap type in the project. (c)
- c. Choose the Place on Face as a placement method. (d)  
Once placement method has been set, move the cursor and Click into desire place.



When all the required plumbing fixtures were placed, the model will look like figure below. The plumbing fixtures can now be connected by the piping system.



Model showing the modelled layout of the HDB typical bathroom.

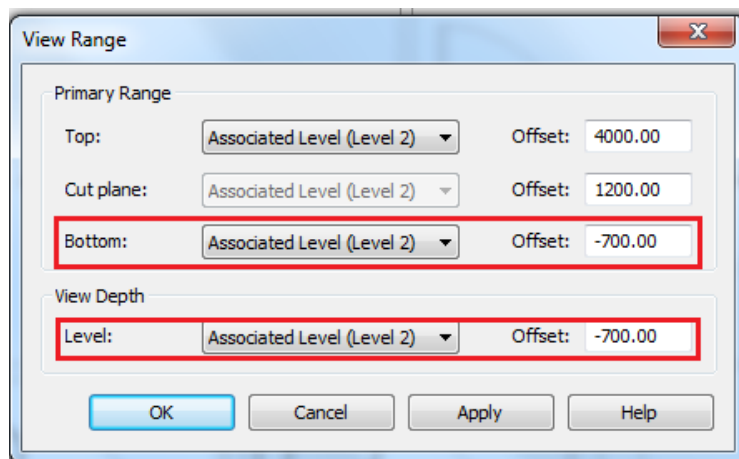
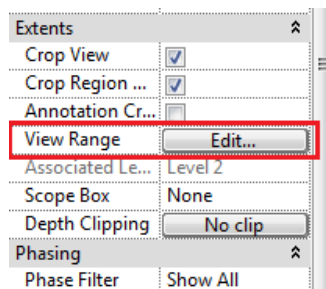
### Step 3: Model Sanitary Pipe System

#### Note:

The slope of the pipe should be considered in modelling the sanitary system. The View Range could be modified to see all the elements into their model.

- Go to the Floor Plan view of the model by double clicking on the Project Browser.
- Open the View Range setting from the Property Box
- Adjust the View Range of the model view and assign negatives values into the Bottom and View Depth; Level. Please refer to the below figure.

Click OK once done.




This will allow the modellers to see and pick the elements below the slabs.

#### Modelling Tip:

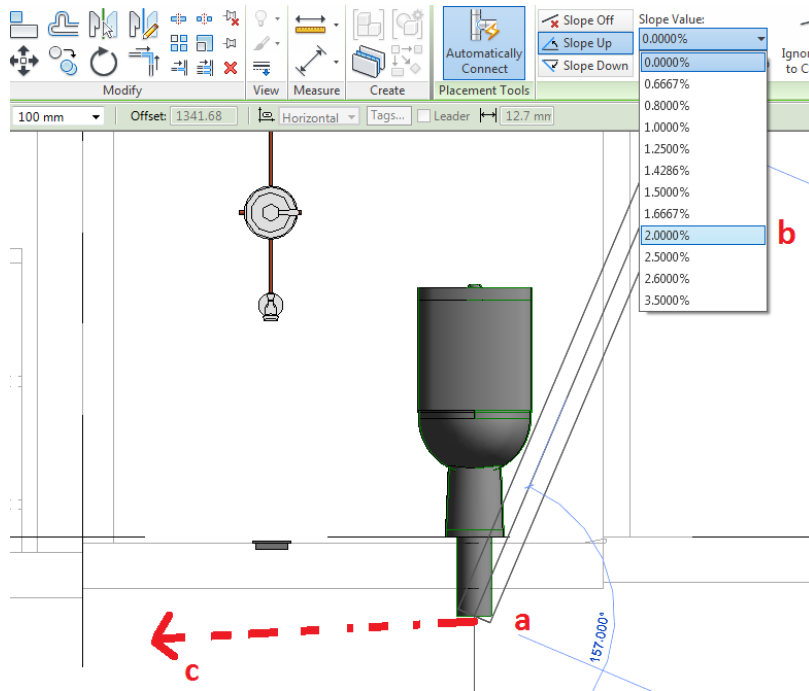
Model in the Wireframe visual style will allow each component of the model to be picked and connected easily.

Start the pipe modelling at the furthest fixture from the riser so that the clearance and slope of the pipe can be easily controlled.

- Cut and open a section with the furthest fixtures on the toilet layout.

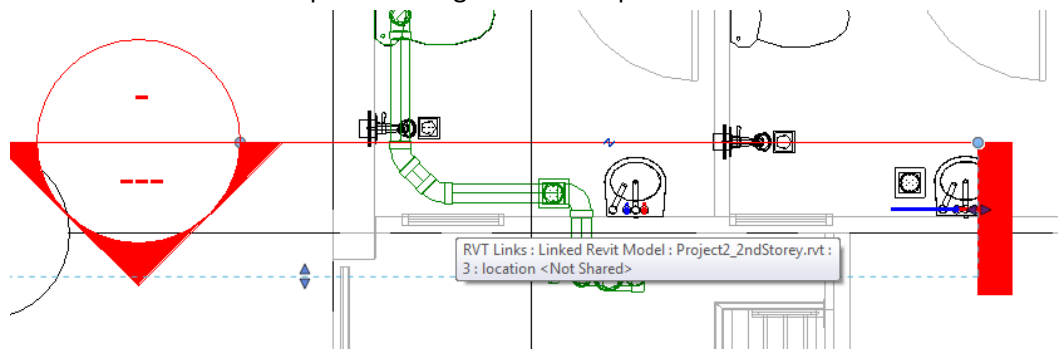
- e. Select it and click the System Icon (  ) and draw a pipe moving from the bottom of the water closet. See the figure below. Stop at point a and assign the slope of the pipe (b) and move the cursor to the left going to MDS direction. (c)

- f. Repeat the same steps until all the water closets are connected to the Riser.



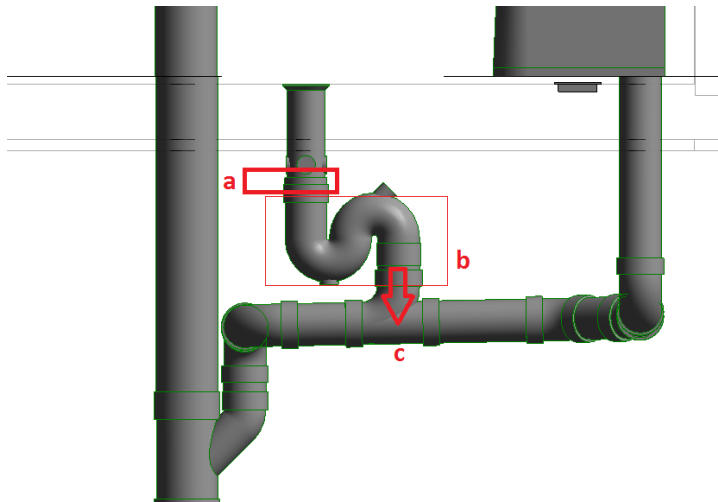
#### Step 4: Connect Floor Trap

- a. Cut a section in the floor plan showing the floor trap.

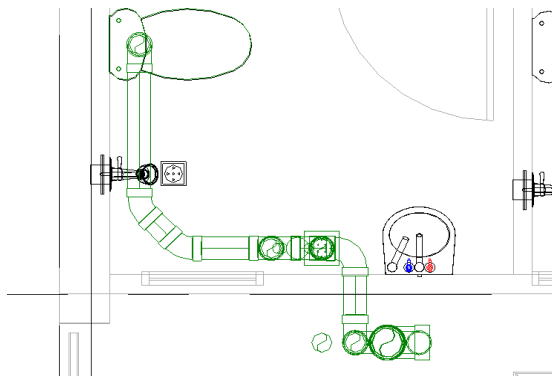


- b. **Create a down pipe** as shown in the below figure. This step is the same as the procedure of connecting the water closet.
- c. Stop at point **a** then **attach the S-trap**. The S-trap family can be loaded by selecting it from the list in the Property Panel of the **Home tab** → **Pipe Fitting** (b). Once the S-Trap had been placed, adjust if necessary to fit the required overhead clearance.

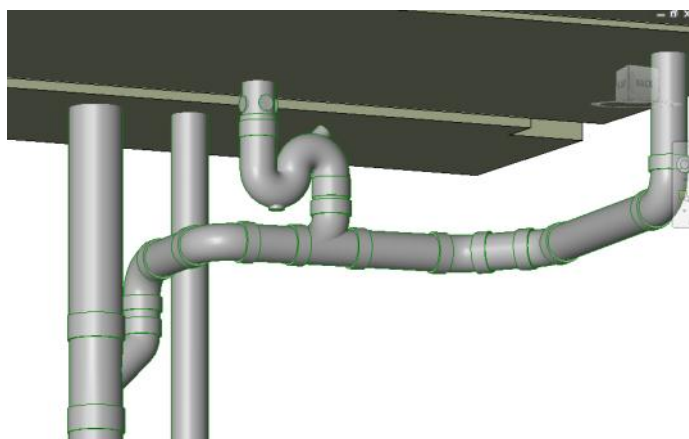
- d. Finally, connect the S-trap to the nearby horizontal pipe. (c) See below figure after all the steps have been done.



- e. Repeat the steps until the rest of the floor traps are connected.





Floor Plan



3D Model

### 3. Modelling Overall Floor Layout

To complete the layout for the whole floors and building, modelers should familiarize themselves to the following commands in Revit.

	<b>Group</b> This is to group all the different elements comprising 1 typical unit to allow reuse or repetition.
	<b>Mirror</b> To create an adjacent copy of the unit.

Grouping Typical Unit Layout:

- Select the all the elements that belongs to the unit.
- From the **Modify**, click the **Group**.

Copying MEP Layout to Adjacent Unit

- a. **Select the grouped unit** and **Click the Mirror** tool from the modify tab.
- b. **Pick the Mirror Axis**. Elements will then be mirrored and placed in an adjacent unit.

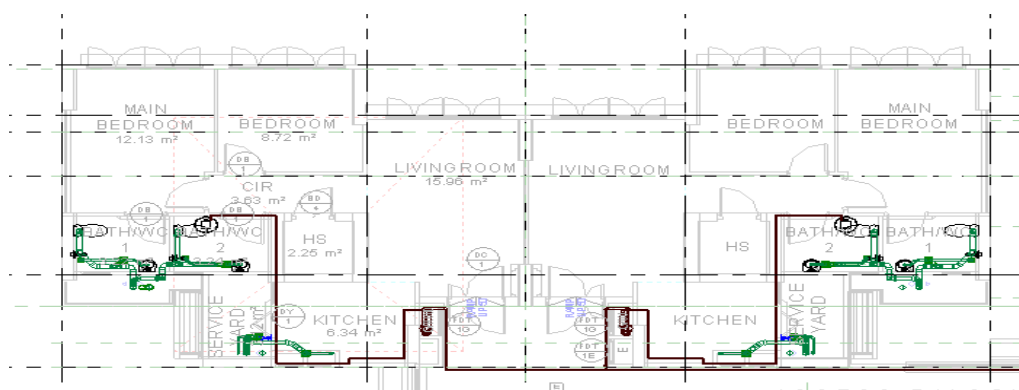
Modelling and Placing Layout into the Different Floors:

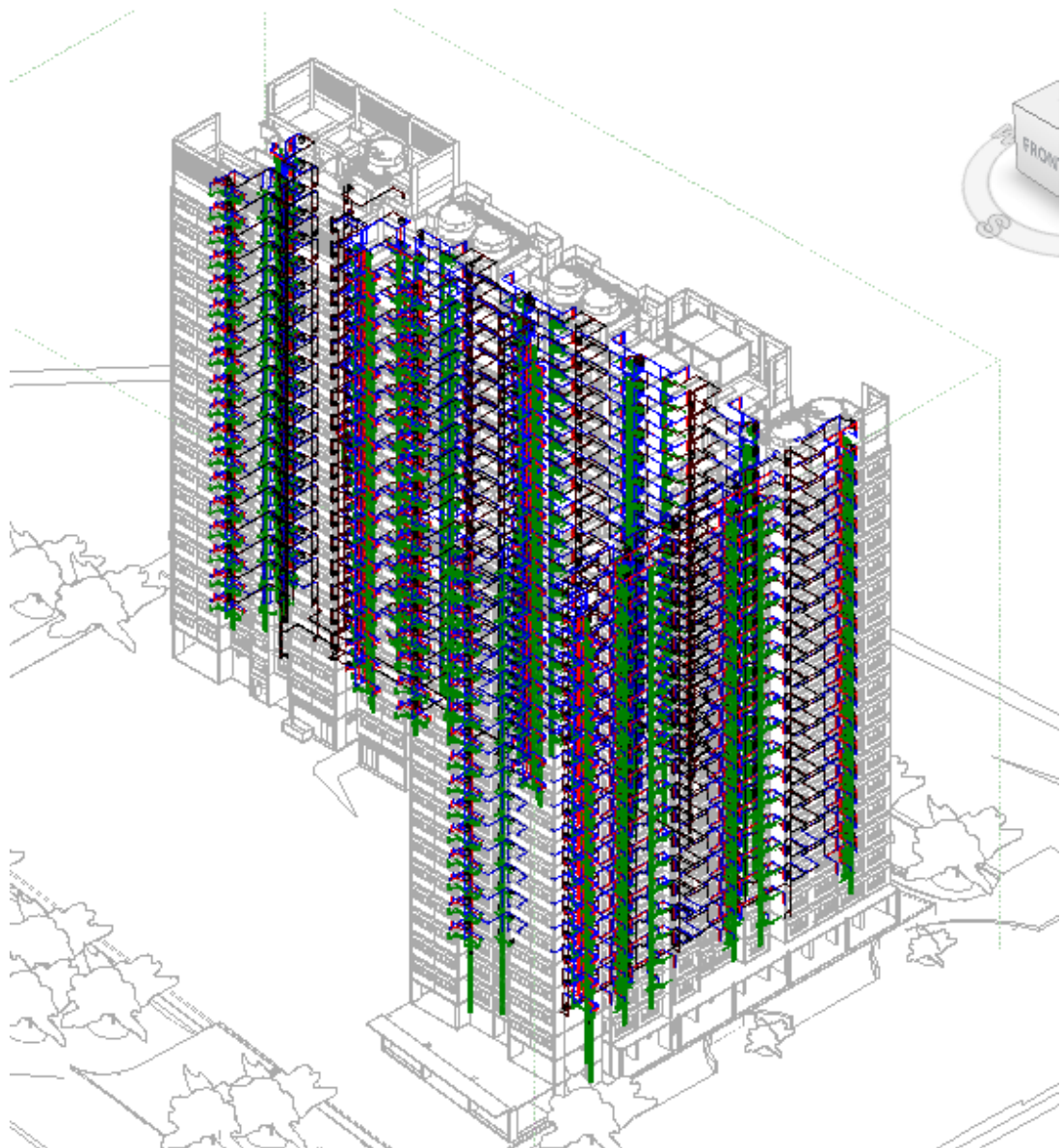
- a. Select the **Group** that you want to copy and place into a different floors.
- b. From the clipboard panel, select Copy to Clipboard.
- c. Then click the **Paste**, from the list, click **Paste to Selected Level** and **tick** the level you intended to place the grouped unit.

#### Modelling Tips:

**The more model Group you copy and paste, the more times it will generate.**

Once done, the model will be like the figures below.





The MEP Model is ready for documentation.

#### 4. Documentation

This is the last step of the Detailed Stage where the model will be prepared for regulatory submission and tendering.

**Objectives:**

To extend the information of the model by putting additional properties such as 2D details and attributes.

**Deliverables:**

- Model for Tendering
- Model for BIM e-Submission

## Step 1: Prepare BIM model for Tendering and e-Submission

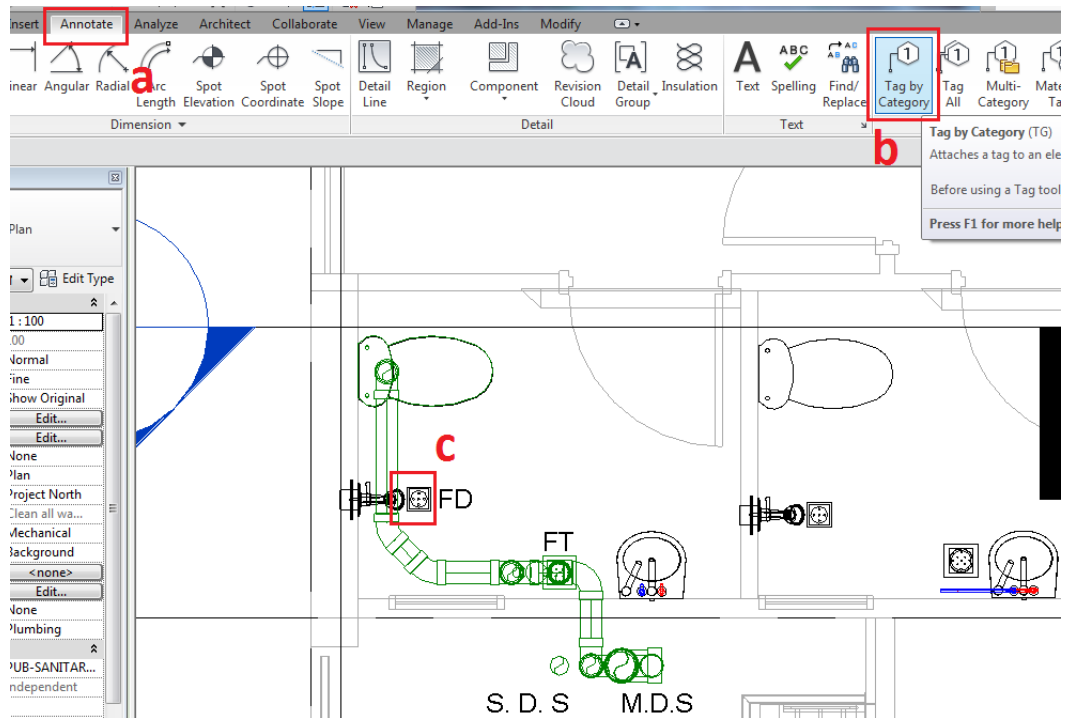
The floor plans, sections and other drawings required for tendering can be generated directly from the BIM model. Reference should be made to the MEP BIM e-submission Guidelines in preparing drawings for regulatory approvals.

The steps below can be applied to both Mechanical and Plumbing trades of the project.

### Preparing Typical Floor Plans

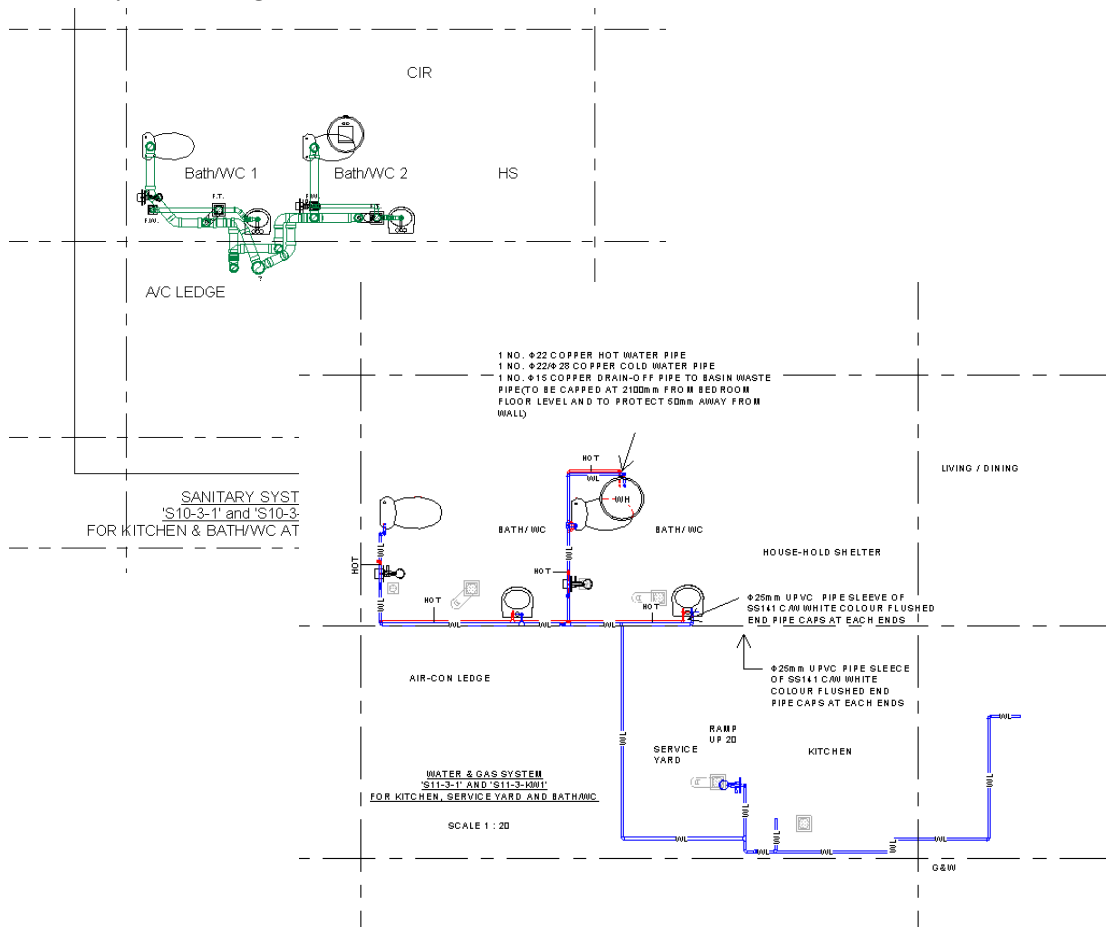
Open the typical floors of the created Region model. Zoom-in to one of the typical units and do the following steps:

- From view tab, select **Callout**. Right click to the selected Callout and **Open the View**
- From the **Annotate** tab, click **Tag by Category** and select the elements in the model.



Standard annotation/tags available in the software can be used to annotate the model. If required load other annotation and customise them. Refer to Revit help for family creation.

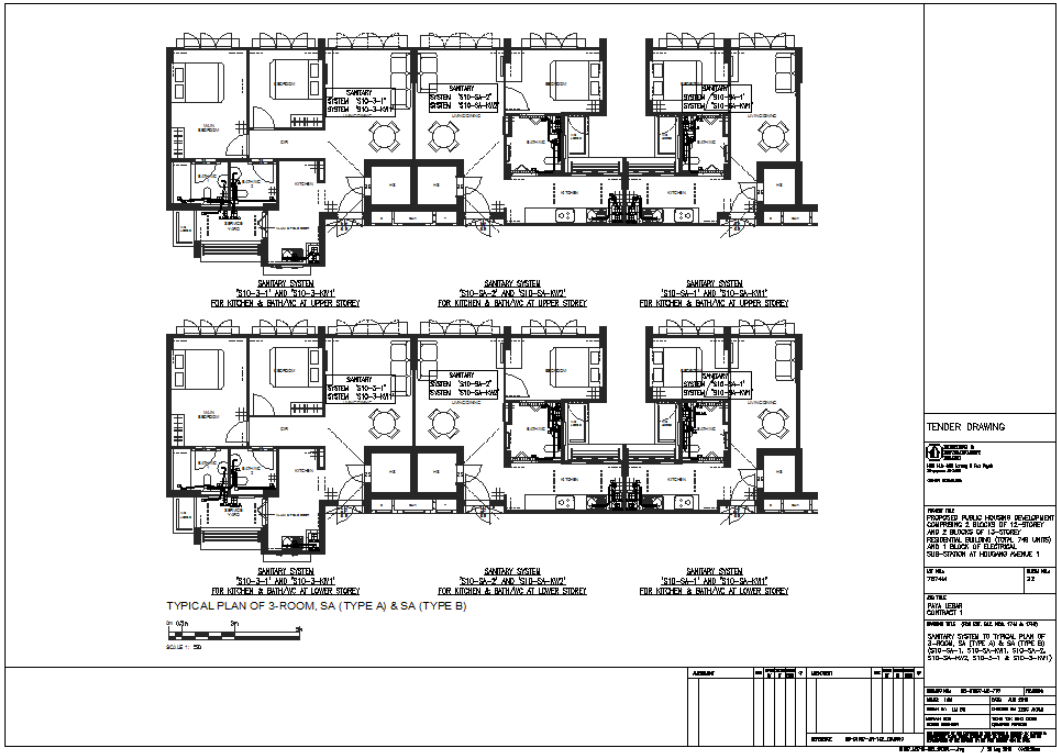
- c. Complete the annotation in the model by using Text tool and other detailing tool if necessary. See the figures below.



### Placing Drawings into Sheets

- Once the drawing views (plans, schematics etc) are clearly annotated, they can be organized and placed in sheets with the steps below:.
- Create a sheet for the intended tender drawing. HDB has standards title block loaded into the template. Select the appropriate one.
- From the project browser, drag and drop the drawing to be placed.
- Once done, the drawing will be the same as the figures on the next page.





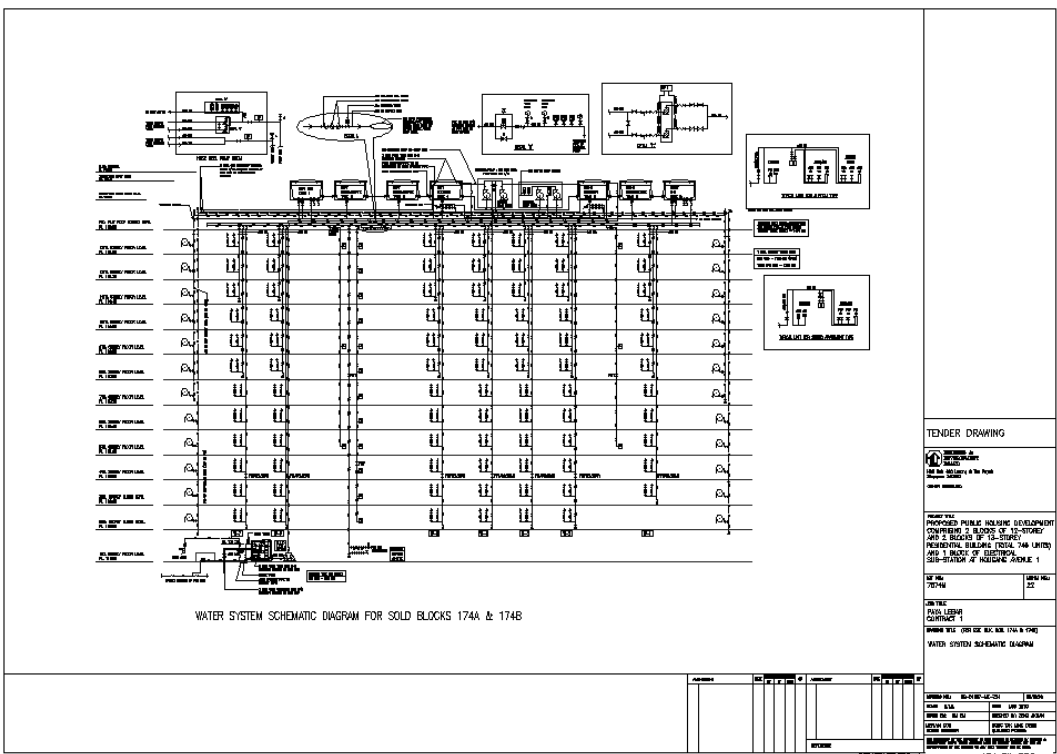
TENDER DRAWING

**PROPOSED PUBLIC HOUSING DEVELOPMENT**  
 COMPREHENSIVE 2 BLOCKS OF 12-STORY  
 AND 2 BLOCKS OF 10-STORY  
 RESIDENTIAL BUILDING TOTAL 748 UNITS  
 AND 1 BLOCK OF ELECTRICAL  
 SUB-STATION AT NEIGHBOURHOOD 1

JOB TITLE: SANITARY SYSTEM  
 DRAWING NO: 210-2-1 AND 210-2-2  
 SHEET NO: 12

DATE: 2024-08-20

SCALE: 1/50



TENDER DRAWING

**PROPOSED PUBLIC HOUSING DEVELOPMENT**  
 COMPREHENSIVE 2 BLOCKS OF 12-STORY  
 AND 2 BLOCKS OF 10-STORY  
 RESIDENTIAL BUILDING TOTAL 748 UNITS  
 AND 1 BLOCK OF ELECTRICAL  
 SUB-STATION AT NEIGHBOURHOOD 1

JOB TITLE: WATER SYSTEM SCHEMATIC DIAGRAM  
 DRAWING NO: 210-2-1 AND 210-2-2  
 SHEET NO: 13

DATE: 2024-08-20

SCALE: 1/50

Repeat the same procedures to produce the documents listed below:

- Content of Contract Drawing
- Layout and Key Plans
- Site Plans
- Floor Plans

**Publishing Model and Drawings to Non-editable File Format**

Refer to Appendix C of Architectural BIM e-Submission Guideline for step-by-step guide to export/ publish to DWF for regulatory submission.

**Note:**

The drawings produced from the BIM model during the Detailed Design stage can form part of the tender documents together with other 2D detail drawing.

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